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NEW NUCLEAR DATA

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INTRODUCTION

This issue of Nuclear Science Abstracts, Volume 9, No. 18B, contains the third 1955 quarterly list of new nuclear data. The data summarized here have come to hand since the preparation of the 1955 semi-annual cumulation which was published in Volume 9, No. 12B. The 1955 annual cumulation will appear early in 1956 in Volume 9, No. 24B. The 1952, 1953, and 1954 annual cumulations are contained in Volume 6, No. 24B; Volume 7, No. 24B; and Volume 8, No. 24B, respectively. These cumulations are available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., for $0.25 each. (Send check or money order but not stamps.) The reporting of information in all the New Nuclear Data lists is continuous. Any apparent gaps in coverage are due to oversights or to delays in the receipt of certain journals and are filled in as promptly as possible.

Nuclear Data Cards: As the current literature is surveyed, the new nuclear results are first printed on 3- by 5-in. cards which are collected into sets of 100 to 150 cards each month. Individuals, laboratories, or libraries may subscribe to the card sets directly by applying to the Publications Office, National Research Council, 2101 Constitution Avenue, N.W., Washington 25, D. C. The price, based on actual mechanical costs, is currently $20 per year domestic and $30 per year foreign (air mail postage included for foreign but not for domestic subscriptions.)

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CONVENTIONS

All energies are given in Mev and all cross sections in barns unless otherwise stated in the tabular material.

Numerals in italics, following measured values, are the errors (as reported by the authors) in the last figures of the values. In cases where confusion seems possible, the conventional ± is used.

Magnetic moments are reported as before without diamagnetic correction. They are based on μ(H) = 2.79267 and the substandards listed by H. Walchli, ORNL-1469.

In writing reactions, the upper right hand superscript denoting A, the mass number of the target nucleus, is given without parentheses when the target was monoisotopic or when enriched (or depleted) material was used to establish the identity of the reacting isotope. It is given in parentheses when natural material was used but when the identity of the reacting isotope was strongly suggested by its predominating abundance, the observed reaction energy, or the activity or yield of the end product. It is given in parentheses with a question mark when the target A was assigned by systematics, elimination, etc. For instance, "B^{10}(d,p)" means that the proton groups from the deuteron bombardment of B^{10} were identified by comparing effects in B^{10} enriched and natural B samples. "B^{11}(d,p)" means that the assignment to B^{11} was made by using B^{11} depleted and natural B samples. "$C^{(12)}$(d,p)" means that natural C was used to study the reaction, but, because of the 99% abundance of C^{12}, the reaction observed was assumed to take place in that isotope. In the reaction "$Sn^{(116)}$(n,p)13^{5}In," the Sn isotope was identified by the In product. "$Te^{(125?)}$(d,p)$Te^{(126?)}$" indicates that from the trend of Q values in the region, the experimenters believed that their measured Q most likely belonged to the indicated reaction.

When a method of production of a radioactive nucleus is given, the lowest bombarding energy used by the experimenter is indicated; e.g., Ag(20-Mev p).

The large black dots on the decay schemes are used to indicate experimentally established coincidences. α, β, or γ rays entering a level and dotted at their arrowheads have been shown to be in coincidence with gamma rays leaving the same level and dotted at their origins. In case of a simple cascade, the dots of the incoming and outgoing rays are superimposed. Dashes are used for doubtful radiations or levels.

For the light nuclei, energy levels in the compound nucleus are usually tabulated rather than the resonant energy of the bombarding particle. The binding energy of the bombarding particle in the compound nucleus is taken from the table of F. Ajzenberg, T. Lauritsen, Revs. Modern Phys. 27, 77(1955) for Z < 11 and from P. M. Endt, J. C. Kluyver, Revs. Modern Phys. 26, 95(1954) for Z from 11 to 20.

ABBREVIATIONS

a	absorption
a $\beta\gamma$	absorption of β's in coincidence with γ's
a ce	absorption of conversion electrons
a coin	absorption of photoelectrons between counters in coincidence
α	total γ-ray conversion coefficient, N_e/N_γ
$\alpha_K, \alpha_L, \ldots$	γ-ray conversion coefficient for electrons ejected from the K, L, ... shell
$\alpha_0, \alpha_1, \ldots$	α to g.s., first excited state, ... of residual nucleus
B	band spectra method
B(E2)	reduced E2 excitation probability in barns^2 (upward transition)
Be(γ,n)	measurement by detection of photoneutrons from Be
B_n,B_p	neutron, proton binding energy, i.e., energy necessary to remove particle from nucleus
$\beta\gamma(\theta)$	angular correlation of β's and γ's in coincidence
calc	calculated from experimental work reported elsewhere
cc	cloud chamber
CcW	Cockcroft Walton accelerator
ce	conversion electrons
chem	chemical separation of product following reaction
Cp	Compton electrons
cryst	crystal spectrometer

d	(1) deuteron, (2) descendant of, (3) days, when used as superscript
d,p(θ)	angular distribution of protons with respect to deuteron beam
D(γ,n),D(γ,p)	measurement by detection of photoneutrons or photoprotons from deuterium
$\bar{E}$	average energy
E_0	resonance energy
E_β,E_γ, ...	energy of β ray, energy of γ ray, ...
E_{dis}	disintegration energy
EA	electrostatic analyzer
E1,E2, ...	electric dipole, electric quadrupole, ...
e_A	Auger electron
el	elastic scattering
ϵ	(1) electron capture, (2) fractional transition probability for decay process observed
ϵ_K,ϵ_L	electron capture from K, L shell
$\eta(\theta)$	$[W(\theta)-W(\pi/2)]/W(\pi/2)$, a measure of asymmetry in angular distributions, where $W(\theta)$ is the count at angle θ
f	fission, in abbreviations for methods of production or detection
F-K	Fermi-Kurie β energy distribution plot
$\gamma(\theta,T)$	numbers of γ's as function of angle and temperature
$\gamma\gamma$, $\beta\gamma$, $\alpha\gamma$, nγ	$\gamma\gamma$, $\beta\gamma$, $\alpha\gamma$, or nγ coincidences. (0.123 γ) (0.246 γ, 0.325 γ) means 0.123 γ in coincidence with 0.246 γ and 0.325 γ
g	gyromagnetic ratio
$\gamma^\pm$	annihilation radiation
Γ	resonance half-width (the whole width at half-maximum)
GM	Geiger-Müller counter
g.s.	ground state
I	(1) nuclear induction magnetic resonance method
IB	internal bremsstrahlung
ic	ionization chamber
IT	isomeric transition
J	spin in units $h/2\pi$
K/L	α_K/α_L
l	angular momentum of particle absorbed into or picked up from nucleus
Lin	linear accelerator
M	molecular or atomic beam resonance method
m	medium intensity
M1,M2, ...	magnetic dipole, magnetic quadrupole, ...
mb	millibarns
Mic	microwave method
mir	measurement by total reflection of neutron beam from mirror surface
ms	mass spectrometer
μ	(1) magnetic moment in units of nuclear magnetons, (2) micron, 10^{-4} cm
μ_3	magnetic octupole moment in units of nuclear magneton barns
μs	microseconds
ν	neutrino
osc	pile oscillator method
p	(1) proton, (2) predecessor of
pr	electron-positron pair
p res	proton resonance. Magnetic field standardized by means of proton resonance frequency
para	paramagnetic resonance method
parentheses	parentheses are put around values which are given for identification purposes
pc	proportional counter
pe	photoelectrons
ppl	photoplates or emulsions
primes	primes indicate inelastically scattered particles
q	electric quadrupole moment in units of barns
quad res	quadrupole resonance method
Q	reaction energy in Mev
s	(1) spectrometer method, (2) seconds, when used as superscript
s coh	coherent scattering
S	atomic spectra measurement
scin	1 crystal scintillation counter
scin Cp	2 crystal scintillation counter
scin pr	3 crystal scintillation counter
sd	double focusing spectrometer
sl	lens spectrometer
sl ce	conversion electrons measured in lens spectrometer
st	strong
sπ	180° spectrometer
sπ pr	180° pair spectrometer
σ	cross section in barns
σ_0	cross section at resonance energy, E_0
σ_a	absorption cross section
σ_t	total cross section
Σ scin	scintillation counter used to sum energy of transitions in cascade

t	(1) triton, H^3, (2) total cross section when used under σ in cross section list
trans	transmission
T	(1) isotopic spin; (2) temperature
τ	half life in units indicated
τ_1, τ_2	half life of upper, lower state
$\tau_{\beta\beta}, \tau_{\epsilon\epsilon}$	half life for double β, double ϵ decay
$\tau_\gamma(E2)$	partial half-life for de-excitation by E2 γ transition (downward transition)
th	thermal
VdG	Van de Graaff accelerator
w,vw	weak, very weak
$Y_\gamma, Y_p, \ldots$	yield of γ rays, yield of protons, ...
%	% of disintegrations
†	relative numbers. When used in connection with γ rays, relative numbers of photons, not photons plus conversion electrons, are meant
+,−	even, odd parity when used in connection with level properties

Standard journal abbreviations are used.

TABLE 1 — RADIOACTIVITY, LEVELS, ABUNDANCES, MOMENTS

ν

$\sigma[Cl^{37}(\nu, e^-)A^{37}] < 2\times10^{-18}$b for fission ν

R. Davis, Jr., Phys. Rev. 97, 766; 99, 664 (1955).

He^4 2 2 stable

$H^2(d,n)$ $E_d = 0.10$ ppl

d, n(θ) for $0° < \theta < 150°$ $\eta(\pi) = 0.48 \pm 0.09$

J.C. Fuller, D.C. Ralph, Phys. Rev. 98, 248A (1955).

He^5 2 3 $\sim10^{-21}$s

Level $Li^{(6)}(d,He^3)$ $E_d = 14.4$ s

2.1* g.s. Q = 0.91 *9*

$Li^{(7)}(d,\alpha)$ s

32* g.s. Q = 14.26 *9*

*mb/sterad at 12.3°, 11.2° c.m. resp.

S.H. Levine, R.S. Bender, J.N. McGruer, Phys. Rev. 97, 1249 (1955).

$H^3(d,\gamma)$ $E_d = 0.16$

$\sigma < 0.5$ mb scin

G.A. Sawyer, L.C. Burkhardt, Phys. Rev. 98, 1305 (1955).

$H^2(t,\alpha)$ $E_t = 1.5$ pc

$\int d\sigma = 0.280$ *8* t, $\alpha(\theta)$

A. Hemmendinger, H.V. Argo, Phys. Rev. 98, 70 (1955).

He^6 2 4 0.83^s

Levels $Li^{(7)}(d,He^3)$ $E_d = 14.4$ s

8* g.s. $l_p = 1$ d, $He^3(\theta)$

2* (1.71) $l_p = 1$

*mb/sterad at 17°, 16.5° c.m. resp.

S.H. Levine, R.S. Bender, J.N. McGruer, Phys. Rev. 97, 1249 (1955); 95, 640A (1954).

Levels $Li^{(7)}(t,\alpha)$ $E_t < 3.8$ ppl

$\sigma \leq 0.01$ 1.6 *6* Q = 8.2 One event

$\sigma \leq 0.01$ 4.2 *5* Q = 5.6 One event

P. Cüer, D. Magnac-Valette, G. Baumann, Compt. rend. 240, 1880 (1955).

Li^4 3 1

$H(He^3,He^3)$ $E_{He^3} = 14.9$ ppl

He^3, $He^3(\theta)$ shows minimum near 90°c.m.

D.R. Sweetman, Phil. Mag. 46, 358 (1955).

Li^5 3 2

$He^4(p,p)$ $E_p = 9.76$ ppl

p, p(θ) results agree with Putnam's

J.H. Williams, S.W. Rasmussen, Phys. Rev. 98, 56, 1167A (1955).

Li^6 3 3 stable

μ +0.821921 I

$\nu(Li^6)/\nu(H^2) = 0.958638$ *38*

H.E. Walchli, ORNL-1775 (1954).

Levels $Li^{(7)}(d,t)$ $E_d = 14.4$ s

32.4* g.s. $l_n = 1$ d, t(θ)

16.0* (2.19) $l_n = 1$

*mb/sterad at 11°, 16° c.m. resp.

S.H. Levine, R.S. Bender, J.N. McGruer, Phys. Rev. 97, 1249 (1955); 95, 640A (1954).

Levels $He^4(d,d)$ $E_d = 0.3$ to 4.6 EA

Level	Γ	J
2.187	0.035	3^+
(3.58)	No scattering anomaly	
4.53*		2^+
5.4 *		1^+

*From phase shift analysis of broad anomaly from $E_d = 3$ to 4.62. This analysis suggests odd additional levels above 5 Mev.

A. Galonsky, R.A. Douglas, W. Haeberli, M.T. McEllistrem, H.T. Richards, Phys. Rev. 98, 586, 590 (1955); 96, 824A; 93, 928A (1954).

Li^7 3 4 stable

μ +3.256003 I

$\nu(Li^7)/\nu(Na^{23}) = 1.469225$ *3*

H.E. Walchli, ORNL-1775 (1954).

Level $Li^{(7)}(d,t)Li^6$ g.s. and 2.19 level

g.s. $l_n = 1$ See Li^6

$Li^{(7)}(d,He^3)He^6$ g.s. and 1.71 level

g.s. $l_p = 1$ See He^6

S.H. Levine, R.S. Bender, J.N. McGruer, Phys. Rev. 97, 1249 (1955).

Li^7
3 4
stable

Levels	$Li^{(6)}(d,p)$	$E_d = 14.4$	s
12.8*	g.s.	$l_n = 1$	d, p (θ)
9.2*	(0.478)	$l_n = 1$	
< 3*	(4.61)	not observed	
32.0*	6.56	Q = 0.91	

*mb/sterad at 18°, 17.5°, < 20°, 12.3° c.m. resp.

	$Li^{(7)}(d,d')$	$E_d = 14.4$	s
	g.s.		
7.7*	(0.478)	$l_d = 2$	d, d' (θ)
8.8*	4.62 *4*	$l_d = ?$	

*mb/sterad at 32°, 47° c.m. resp.

S.H.Levine, R.S.Bender, J.N.McGruer, Phys. Rev. 97, 1249 (1955); 95, 640A (1954).

Level $Li^{(7)}(\alpha,\alpha'\gamma)$ $E_\alpha = 5.3$ scin
0.483
No other γ observed

R.J.Breen, M.R.Hertz, Phys. Rev. 98, 599 (1955).

Levels $Be^9(d,\alpha)Li^7 \rightarrow \alpha + t$ $E_d = 1.25$
4.6 ppl 30°
6.6 Magnetic field
No 5.5 level found for t separation

P.Cüer, J.Jung, J. phys. radium 16, 385 (1955).

Li^8
3 5
0.84^s

Levels	$Li^{(7)}(d,p)$	$E_d = 14.4$	s
26.1*	g.s.	$l_n = 1$	d, p (θ)
10.2*	0.974 *15*	$l_n = 1$	Q = −1.162

*mb/sterad at 8°, 2° c.m. resp.

S.H.Levine, R.S.Bender, J.N.McGruer, Phys. Rev. 97, 1249 (1955); 95, 640A (1954).

Level $Li^{(6)}(t,p)$ $E_t < 3.8$ ppl
0.7 *2* Q = 0.10 One event

P.Cüer, D.Magnac-Valette, G.Baumann, Compt. rend. 240, 1880 (1955).

Be^7
4 3
53.6^d

Levels $Li^{(7)}(p,n)$ $E_p = 2.5$ to 2.9
100+ g.s. $He^3(n,p)$ detector
3+ to 8+ (0.43) at forward angles
σ(0.43 level)/σ(g.s.) increases with E_p

R.Batchelor, Proc. Phys. Soc. 68A, 452 (1955).

Levels $B^{10}(p,\alpha)$ $E_p = 18$; 60°, 90°, 120°

g.s.	Q = 1.07 *10*	ic
0.49 *10*		
4.72 *8*		
6.27 *10*		
7.21 *10*		
14.6 *3*		

J.S.Reynolds, Phys. Rev. 98, 1289 (1955); 95, 629A (1954).

Be^7
4 3
53.6^d

Capture γ's $Li^6(p,\gamma)$ $E_p = 0.300$

35+	0.43 *2*
35+	5.40 *15*
65+	5.90 *15*

+Photons/100 Li^6 captures
σ for cascade = 0.7 μb at $E_p = 0.415$

Level (6.35) $E_p = 0.18$ to 0.415
0.43 γ yield as f(E_p) gives $(2J+1)\Gamma_\gamma = 1.0$ *3* for cascade transition from this level

S.Bashkin, R.R.Carlson, Phys. Rev. 97, 1245; 98, 230A (1955).

Be^8
4 4
$\sim 10^{-16}$s

Level $Be^9(d,t)$ $E_d = 0.58$ to 1.40
g.s. d, t (θ) See Be^9

M.K.Jurić, Phys. Rev. 98, 85 (1955); Bull. Inst. Nuclear Sci., Boris Kidrich 5, 7 (1955); 3, 139 (1953).

Levels $Li^{(7)}(d,n)$ $E_d = 2$ pc, scin
g.s. $l_p = 1$ d, n (θ)
~3 $l_p = 1$

C.C.Trail, C.H.Johnson, Phys. Rev. 98, 249A (1955).

Level $B^{(11)}(p,\alpha_1)2\alpha$ $E_p = 0.163$
(2.9) J = 2 α, α (θ)

E.H.Geer, E.B.Nelson, E.J.Wolicki, Phys. Rev. 98, 241A (1955).

Levels $Be^9(d,t)$ $E_d = 1.25$ ppl 30°
g.s. Magnetic field
2.8 for t separation
No other level with energy < 2.8

P.Cüer, J.Jung, J. phys. radium 16, 385 (1955).

Levels
$B^{(11)}(p,\alpha)$ $E_p = 2.61$ 10°, 90°
$B^{10}(d,\alpha)$ $E_d = 1.43$ ~0°; $E_d = 2.09$ 108°; $E_d = 2.39$ 60°, 90°, 108°; $E_d = 3.18$ 60°, 108°
g.s. s
2.94
No other level with energy < 8
Several thousand counts for each E, $\Delta E \sim 0.1$

R.E.Holland, D.R.Inglis, R.E.Malm, F.P.Mooring, Phys. Rev. 99, 92; 98, 240A (1955).

Levels $Li^{(7)}(d,n)$ $E_d = 0.88$
g.s. ppl 120°
2.1 ?
2.9 $\Gamma \sim 0.8$
4.1
5.3

W.M.Gibson, Phil. Mag. 46, 807 (1955).

Be^{8} 4 4 ~10^{-16}s

Levels $Li^{(7)}(d,n)$ $E_d = 0.686$
g.s. ppl 90°, 115°, 145°
~3
5.4 ?
7.5

M.A.Ihsan, Phys. Rev. 98, 689 (1955); Proc. Phys. Soc. 68A, 393 (1955).

Be^{9} 4 5 stable

Level $Be^9(d,t)Be^8$ g.s. ppl
g.s. d,t(θ) $E_d = 0.58$ to 1.40
d,t(θ) shows forward pick-up peak at all E_d
Peak is largest at $E_d = 1.28$ See Be^{10}, B^{11}

M.K.Jurić, Phys. Rev. 98, 85 (1955); Bull. Inst. Nuclear Sci., Boris Kidrich 5, 7 (1955); 3, 139 (1953).

Levels $B^{(11)}(d,\alpha)$ $E_d = 1.51$
g.s. s 50°, 90°, 101°
1.75* *2*
2.43 *2*
3.02* *3*
4.41 ? ⎤ Believed to be ghosts
4.59 ? ⎦
*Low intensity (especially at 90°) and large natural widths

L.L.Lee, Jr., D.R.Inglis, Phys. Rev. 99, 96 (1955).

Be^{10} 4 6 2.5×10^{6}y

Level $Be^9(d,p)$ $E_d = 0.62$ to 1.40
g.s. d,p(θ) ppl
Forward peak intensity ($l_n = 1$?) is greatest for $E_d = 1.19, 1.40$ See Be^9, B^{11}

M.K.Jurić, Phys. Rev. 98, 85 (1955); Bull. Inst. Nuclear Sci., Boris Kidrich 5, 7 (1955); 3, 139 (1953).

Levels $Be^9(n)$ $E_n = 0.2$ to 1.50
$Be^9(n,n)$ $E_n = 0.54, 0.62, 0.70$

$\int d\sigma$*	σ_o	Level	E_o	J	l	Γ
7.5	7.8	(7.37)	(0.62)	3	1(2?)	0.025
	5.3	(7.54)	(0.81)	2		0.008

*From n,n(θ)

H.B.Willard, J.K.Bair, J.D.Kington, Phys. Rev. 98, 669 (1955).

B 5

γ $B(n,?\gamma)$ $E_n = 4.5$ scin
w 0.70 Not found for $E_n = 1.3$
2.20 *6*

G.L.Griffith, Phys. Rev. 98, 579 (1955).

B^{9} 5 4

Levels $C^{(12)}(p,\alpha)$ $E_p = 18$; 60°, 90°, 120°
g.s. Q = −7.58 *10* ic
2.39 *8*
No other level with energy < 7.9 observed

J.B.Reynolds, Phys. Rev. 98, 1289 (1955); 95, 639A (1954).

B^{10} 5 5 stable

Levels $Be^9(d,n)$ $E_d = 0.695$ ppl
g.s. ⎤
(0.72) ⎥
(1.74) ⎥ d,n(θ)
(2.15) ⎥
(3.58) $l_n = 1$ ⎦
d,n(θ) shows stripping for 3.58 level only

J.Génin, Compt. rend. 240, 2514 (1955).

Levels $Be^9(d,n)$ $E_d = 0.860$ ppl
g.s. Q = 4.54 *6* ⎤
0.75 *8* ⎥
1.79 *7* ⎥ d,n(θ)
2.23 *7* ⎥
3.77 *7* $l_n = 1$ ⎦
d,n(θ) shows stripping for 3.77 level only

L.L.Green, J.P.Scanlon, J.C.Willmott, Proc. Phys. Soc. 68A, 386 (1955).

Level $Be^9(p,\gamma)$ $E_p = 0.15$ to 0.52
6.86 $E_o = 0.307$* scin($E_\gamma > 2.5$)
No resonance found for $E_p = 0.49$
Yield for $E_\gamma > 5.6$ shows non-resonant rise
*From Breit-Wigner fit with corrections for target thickness, barrier penetration

O.Lönsjö, O.Os, R.Tangen, Phys. Rev. 98, 727 (1955).

Capture γ's $Be^9(p,\gamma)$ $E_p = 0.255$ to 0.495
6.89 level ($E_p = 0.33$) J = 1

~5+	0.41 *2*	scin
100+	0.72 *2*	
27+	1.03 *3*	
5+	1.43 *3*	
45++	4.70 *15*	scin pr
100++	5.1 *1*	
40++	6.0 *1*	
15++	6.70 *15*	

(1.03 γ)(0.72 γ)(θ) consistent with $J = 0^+$, (1^+ or 2^+), 3^+
(5.1-Mev γ's)/proton = 1.2×10^{-10} for $E_p = 0.315$

R.R.Carlson, E.B.Nelson, Phys. Rev. 98, 1310 (1955); 95, 641A (1954).

B^{11} 5 6 stable

Level $C^{(12)}(t,\alpha)$ $E_t < 3.8$ ppl
$\sigma \leq 0.01$ g.s. Q = 3.85 Two events

P.Cüer, D.Magnac-Valette, G.Baumann, Compt. rend. 240, 1880 (1955).

Level $B^{(11)}(n,n'\gamma)$ $E_n = 4.5$; γ scin
2.20 *6*

G.L.Griffith, Phys. Rev. 98, 579 (1955).

$B^{10}(n,n)$ $E_n = 0.55, 1.00, 1.50$
Phase shifts found from n,n(θ)

H.B.Willard, J.K.Bair, J.D.Kington, Phys. Rev. 98, 669 (1955).

B^{11} 5 6 stable

Levels $Be^9(d,t)$ $E_d = 0.58$ to 1.40
$Be^9(d,p)$ $E_d = 0.62$ to 1.40

Level	E_d*	Reaction
16.79 ?	1.19	(d,p)
16.87 ?	1.28**	(d,t)
16.97 ?	1.40	(d,p)

*E_d values for maxima in forward peak intensities which may mean resonance.
See also Berthelot et al., Stratton et al, O^{17}
**(t yield)/(p yield) has maximum

M.K.Jurić, Phys. Rev. 98, 85 (1955); Bull. Inst. Nuclear Sci., Boris Kidrich 5, 7 (1955); 3, 139 (1953).

$Be^9(d,\gamma)$ $E_d = 1.5$
$\sigma < 2\times10^{-5}$ $Pr^{141}(\gamma,n)$ detection

H.R.Allan, N.Sarma, Proc. Phys. Soc. 68A, 535 (1955).

B^{12} 5 7 0.03^s

Levels $B^{11}(n,n)$ $E_n = 0.2$ to 1.50

$\int d\sigma$*	Level	E_o	J	l
7.5	(3.76)	(0.43)	2	1
4.7	(4.53)	(1.28)	3	2

*From $n,n(\theta)$

H.B.Willard, J.K.Bair, J.D.Kington, Phys. Rev. 98, 669 (1955).

C^{11} 6 5 20.4^m

$B^{10}(p,\alpha)$
No resonances for $E_p = 0.08$ to 0.205, 115°
$\sigma(E_p = 0.200) = 0.66 \pm 0.09$ mb assuming α's are isotropic Magnetic analyzer

G.G.Bach, D.J.Livesey, Phil. Mag. 46, 824 (1955).

C^{12} 6 6 stable

Levels $B^{11}(d,n)$ $E_d = 0.60$ scin
g.s. $l_p = 1$ $d,n(\theta)$
(4.43) $n(\theta)$ ~sym. about 90°

A.Ward, P.J.Grant, Proc. Phys. Soc. 68A, 637 (1955).

Level $Be^9(\alpha,n\gamma)$ $E_\alpha = 5.3$
4.45 γ scin
No other γ observed

R.J.Breen, M.R.Hertz, Phys. Rev. 98, 599 (1955).

Level $C^{12}(n,n'\gamma)$ $E_n = 14$
$\sigma = 0.24$ 4.4 scin pr
No other γ with $1.6 < E_\gamma < 5.5$

M.E.Battat, E.R.Graves, Phys. Rev. 97, 1266 (1955).

C^{12} 6 6 stable

Levels $B^{11}(d,n)$ $E_d = 0.6$ ppl

11+	g.s.	Q = 13.81	$d,n(\theta)$*
28+	4.40		$d,n(\theta)$
7+	7.63	$\Gamma = 0.3$	
36+	9.71		$d,n(\theta)$*

+Relative n peak group intensities at 95°
*Similar, probably show stripping

M.A.Ihsan, Proc. Phys. Soc. 68A, 393 (1955).

Level $B^{11}(p,\alpha)Be^8$ 2.9 level
16.10 J = 2 $\alpha,\alpha(\theta)$ $E_p = 0.163$
Data at $E_p = 0.29$ not explained by pure 1^-, 2^-, or 3^+ C^{12} state

E.H.Geer, E.B.Nelson, E.J.Wolicki, Phys. Rev. 98, 241A (1955).

Levels $B^{11}(p,\alpha)$ $E_p = 1.9$ to 2.7
17.76 s 90°
18.34

R.E.Holland, D.R.Inglis, R.E.Malm, F.P.Mooring, Phys. Rev. 99, 92 (1955).

Resonance $C^{12}(\gamma,p_o)$ $E_\gamma \leq 23$
peak 21.5
No p group to B^{11} 2.14 level (< 25% of p_o)

A.K.Mann, W.E.Stephens, D.H.Wilkinson, Phys. Rev. 97, 1184; 98, 241A (1955).

Resonance $C^{12}(\gamma,3\alpha)$ $E_\gamma \leq 330$
peaks ~25 42 stars observed
~30 in ppl
No other resonances below 100 Mev

S.D.Softky, Phys. Rev. 98, 173 (1955).

Resonance $C^{12}(\gamma,3\alpha)$ $E_\gamma \leq 100$
peak 27 $\sigma_{max} \sim 0.25$ mb ppl

A.M.Gurevitsch, Paper 2205, E.T.H.Zurich (1953); Phys. Abstr. 58, #3103 (1954).

C^{13} 6 7 stable

Level $C^{12}(d,p)$ $E_d = 1.86$ to 3.45
g.s. ic, several angles
Forward peak intensity varies markedly as E_d goes through resonances (see N^{14})

K.W.Jones, M.T.McEllistrem, R.A.Douglas, D.F. Herring, E.Silverstein, Phys. Rev. 98, 241A (1955).

Level $B^{10}(\alpha,p\gamma)$ $E_\alpha = 5.3$
3.68 γ scin

R.J. Breen, M.R. Hertz, Phys. Rev. 98, 599 (1955).

C^{13}
6 7
stable

γ $C^{(12)}(d,p\gamma)$ $E_d = 4.0$ sl pr

4.0*	3.76 *2*	No Doppler corrections
4.5*	3.86 *2*	

No γ's with $3.9 < E_\gamma < 5.8$ (<10% of 3.86 γ)
*Average σ in mb for $E_p = 0$ to 4.0

R.D.Bent, T.W.Bonner, R.F.Sippel, Phys. Rev. 98, 1237 (1955).

$C^{(12)}(n,n)$ $E_n = 0.55, 1.00, 1.50$
Phase shifts found from n,n(θ)

H.B.Willard, J.K.Bair, J.D.Kington, Phys. Rev. 98, 669 (1955).

Levels $C^{(12)}(n,n)$ $E_n = 1.9$ to 3.8

Level	E_o	J	l
6.87	2.08		≥2
7.67	2.95	3/2	2
8.32	3.62	3/2	2

Phase shift analysis of n,n(θ) C recoil
Old results corrected and extended

R.Budde, P.Huber, Helv. Phys. Acta 28, 49 (1955); 27, 512A (1954).

Levels $C^{(12)}(n)$ $E_n = 4.4$ to 5.5, 7.5 to 8.7
9.57
9.95
12.17
12 - 13 broad peak

R.L.Becker, R.B.Perkins, H.H.Barschall, Phys. Rev. 99, 1646A (1955).

$Be^9(\alpha,\gamma)$ $E_\alpha = 1.6$
$\sigma < 2 \times 10^{-5}$ scin

H.R.Allan, N.Sarma, Proc. Phys. Soc. 68A, 535 (1955).

C^{14}
6 8
$\sim 5600^y$

γ $C^{13}(d,p\gamma)$

0.811 *3*	$E_d = 2.6$*	sl pe
6.120 *25*	$E_d = 1.42$	sl Cp
6.73 *4*	$E_d = 1.9$	sl Cp

No Doppler corrections *Threshold at 1.9

R.J.Mackin, Jr., W.B.Mims, W.R.Mills, Jr., Phys. Rev. 98, 43 (1955); 93, 950A (1954).

γ $C^{13}(d,p\gamma)$ $E_d = 2.4$ sl pr

4.1,52*	6.14 *3*	No Doppler corrections
25,26*	6.72 *3*	

No 6.9 γ (<10% of 6.72 γ)
*Average σ in mb for $E_d = 1$ to 2, 3.4 to 4

R.D.Bent, T.W.Bonner, R.F.Sippel, Phys. Rev. 98, 1237 (1955); 95, 649A (1954).

Level $C^{(12)}(t,p)$ $E_t < 3.8$ ppl
6.1 Q = -1.5 One event
Expected reaction to C^{14} g.s. not observed

P.Cüer, D.Magnac-Valette, G.Baumann, Compt. rend. 240, 1880 (1955).

N^{14}
7 7
stable

q +0.0071
Calculated from q coupling of HCN* using self-consistent field wave function

A.Bassompierre, Compt. rend. 240, 285 (1955); *Simmons, et al., Phys. Rev. 77, 77 (1951).

Levels $C^{13}(d,n)$ $E_d = 0.86$ ppl

g.s.		d,n(θ)
2.34 *7*		
4.02 *7*		
5.02 *7*	$l_n = 0$	
5.20 *7*		

d,n(θ) shows stripping for 5.02 level only

L.L.Green, J.P.Scanlon, J.C.Willmott, Proc. Phys. Soc. 68A, 386 (1955).

Level $N^{(14)}(p,p'\gamma)$ $E_p = 3.92$
γ (2.31) $\tau \sim 2 \times 10^{-13}$s scin
Doppler effect $\Delta E/E \sim 0.01$

J.Thirion, R.Barloutaud, Compt. rend. 240, 2136 (1955).

Level $B^{(11)}(\alpha,n\gamma)$ $E_\alpha = 5.3$
2.36 γ scin

R.J.Breen, M.R.Hertz, Phys. Rev. 98, 599 (1955).

γ $C^{13}(d,n\gamma)$ sl pr

19*	3.42 *3*		$E_d = 2.0$
5.3*	3.71 *5*	N^{14} or C^{13}?	
3.3*	3.94 *6*	N^{14} or C^{13}?	
3.5*	4.48 *4*	N^{14}, C^{14}, or B^{11}?	
9.7*	4.96 *3*		
11*	5.12 *4*		
9.1*	5.74 *3*		
3.3*, 9.7**	6.53 *4*		$E_d = 4.0$
8.2**	7.09 *3*		
3.1**	7.34 *4*		

*Average σ in mb for $E_d = 1.0$ to 2.0
**Average σ in mb for $E_d = 3.4$ to 4.0
No Doppler corrections

R.D.Bent, T.W.Bonner, R.F.Sippel, Phys. Rev. 98, 1237 (1955); 95, 649A (1954).

γ $C^{13}(d,n\gamma)$

	0.729 *3*	$E_d = 2.6$ sl pe
0.14+	3.91 *5*	$E_d = 1.42$ sl Cp
0.37+	4.93 *4*	
0.34+	5.13 *3*	
0.45+	5.73 *3*	
	6.45 *5*	$E_d = 1.9$ sl Cp

+Relative yield at $E_d = 1.42$
No Doppler corrections

R.J.Mackin, Jr., W.B.Mims, W.R.Mills, Jr., Phys. Rev. 98, 43 (1955); 93, 950A (1954).

N^{14}
7 7
stable

$C^{(12)}(d,\gamma)$ $E_d = 1.5$
$\sigma < 10^{-6}$ $Pr^{141}(\gamma,n)$ detection

H.R.Allan, N.Sarma, Proc. Phys. Soc. 68A, 535 (1955).

Resonance peaks $N^{(14)}(\gamma,n)$
10.8 ? $10^{m}N^{13}$ and
11.5 $\Gamma\sim0.3$ n's detected
12.7 $\Gamma\sim1$

B.G.Chidley, L.Katz, Phys. Rev. 99, 1646A (1955).

Levels $C^{(12)}(d,p)$ $E_d = 1.86$ to 3.45
12.02 ic, several angles
12.27
12.41 12.76
12.55 12.84
12.61 12.92

K.W.Jones, M.T.McEllistrem, R.A.Douglas, D.F. Herring, E.Silverstein, Phys. Rev. 98, 241A (1955).

Levels $B^{10}(\alpha,p_o)$ $E_\alpha = 1.4$ to 2.4 ic
$B^{10}(\alpha,n)$ Mn act. and n scin

	n/p	α, (n or p)(θ)
12.69	2.3 *2*	1-0.9 $\cos^2(\theta)$
13.15	~1	1-0.5 $\cos^2(\theta)$

E.S.Shire, R.D.Edge, Phil. Mag. 46, 640 (1955).

N^{15}
7 8
stable

Levels $B^{11}(\alpha,n)$ $E_\alpha = 1.4$ to 2.4
$\alpha, n(\theta)$ scin
12.10 Strong forward and back
12.15 ~Isotropic
12.49 Strong forward

E.S.Shire, R.D.Edge, Phil. Mag. 46, 640 (1955).

O^{15}
8 7
2.1^m

Levels $N^{(14)}(p,p'+2.31\gamma)$
$E_p = 3$ to 4.9 scin
11.01 *3* $\Gamma = 0.082$
11.07 *3* $\Gamma < 0.015$
11.97 *4*

J.Thirion, R.Barloutaud, Compt. rend. 240, 2136 (1955).

O^{16}
8 8
stable

γ $F^{19}(p,\alpha\gamma)$ $E_p = 3.7$ sl pr
2.7* 6.10 *4* No Doppler corrections
3.7* 6.99 *4*
No γ's with $7.5 < E_\gamma < 11$ (< 10% of 6.99 γ)
*Average σ in mb for $E_p = 0$ to 3.7

R.D.Bent, T.W.Bonner, R.F.Sippel, Phys. Rev. 98, 1237 (1955).

O^{16}
8 8
stable

Resonance peaks $O^{16}(\gamma,p_o)$ $E_\gamma \leq 25$
st 14.7 ppl 30° to 150°
w 19.6
w 20.6
st 22.4*
*p groups also to N^{15} 5.3 and 6.3 levels

W.E.Stephens, A.K.Mann, B.J.Patton, E.J. Winhold, Phys. Rev. 98, 839 (1955).

O^{17}
8 9
stable

Level $O^{(16)}(d,p)$ $E_d = 0.58$ to 1.40
g.s. d,p(θ) ppl
Forward peak intensity ($l_n = 2$?) is greatest for $E_d = 0.98$, 1.14 See F^{18}

M.K.Jurić, Phys. Rev. 98, 85 (1955); M.K.Jurić, M.M.Petrović, Bull. Inst. Nuclear Sci., Boris Kidrich 5, 1 (1955).

Levels $O^{(16)}(d,p)E_d = 2.6, 3.0, 3.3, 3.4$
g.s. $l_n = 2$* d,p(θ) pc
(0.87) $l_n = 0$**
*Forward peak intensity greatest for $E_d = 3.01$, 3.43 (near resonances). See F^{18}.
**Distribution shifts with E_d but no general trend observed
Absolute values of σ given

T.F.Stratton, J.M.Blair, K.F.Famularo, R.V. Stuart, Phys. Rev. 98, 629 (1955).

Level $O^{(16)}(d,p)$ $E_d = 1.6$ to 2.2
(0.87) $l_n = 0$ d,p(θ) ppl
Forward peak intensity greatest at resonance, $E_o = 2.06$

A.Berthelot, R.Cohen, E.Cotton, H.Faraggi, T.Grjebine, A.Leveque, V.Naggiar, M.Roclawski-Conjeaud, D.Szteinsznaider, J. phys. radium 16, 241 (1955).

γ $O^{(16)}(d,p\gamma)$ $E_d = 2.6$ sl pe
0.869 *3* No Doppler correction

R.J.Mackin, Jr., W.B.Mims, W.R.Mills, Jr., Phys. Rev. 98, 43 (1955).

Levels $C^{(13)}(\alpha,n)$ $E_\alpha = 1.6$ to 3.8
8.06 0°, 90°
~8.21 8.51
8.34* 8.70
8.41 8.91
8.47 8.96
*Observed at 90° only

R.B.Walton, R.L.Becker, J.D.Clement, M.S. Zucker, Phys. Rev. 99, 1649A (1955).

O^{18} 8 10 stable

Levels O^{17}(d,p) E_d = 1.4, 2.0; 90° s

g.s.	not observed	
1.977	Q = 3.861 *16*	
2.445	Q = 3.393 *16*	

H.D.Holmgren, T.D.Hanscome, D.K.Willett, Phys. Rev. 98, 241A (1955).

O^{19} 8 11 29.4^s

Levels O^{18}(d,p) E_d = 1.4,2.0; 90° s

g.s.	Q = 1.735 *8*
0.094 *8*	
1.471 *13*	

H.D.Holmgren, T.D.Hanscome, D.K.Willett, Phys. Rev. 98, 241A (1955).

Level O^{18}(d,p) E_d = 3.01 s

(1.47) Q = 0.3 *2* ppl

$\sigma(5°)$ = 0.213 b/sterad l_n = 0 d,p(θ)

T.F.Stratton, J.M.Blair, K.F.Famularo, R.V. Stuart, Phys. Rev. 98, 629 (1955); 96, 825A (1954).

F^{18} 9 9 1.87^h

τ 1.85^h *2* $O^{(16)}$(t,n)

σ given for E_t = 0.7 to 2.1

N.Jarmie, Phys. Rev. 98, 41 (1955).

Levels $O^{(16)}$(d,p) See O^{17}

8.39 ? E_d = 0.98* ppl

8.53 ? E_d = 1.14*

*E_d values for maxima in forward peak intensities which may mean resonance. See also Berthelot et al, Stratton et al, O^{17}.

M.K.Jurić, Phys. Rev. 98, 85 (1955); M.K. Jurić, M.M.Petrović, Bull. Inst. Nuclear Sci., Boris Kidrich 5, 1 (1955).

Levels $O^{(16)}$(d,p) E_d = 1.6 to 2.2 pc

Level	E_o*	p group
9.0 ?	1.7 ?	p_1 ?
9.33	2.06	p_1

*From angular distribution integrations

A.Berthelot, R.Cohen, E.Cotton, H.Faraggi, T.Grjebine, A.Leveque, V.Naggiar, M.Roclawski-Conjeaud, D.Steinsznaider, J. phys. radium 16, 241 (1955).

Levels $O^{(16)}$(d,p) E_d = 2.2 to 3.8

Level	E_o	p group	
10.09	2.93	p_o	pc
10.50	3.39	p_o	53°
10.74	3.67	p_o	

See O^{17} for d,p(θ) results

T.F.Stratton, J.M.Blair, K.F.Famularo, R.V. Stuart, Phys. Rev. 98, 629 (1955).

F^{19} 9 10 stable

Levels F^{19}(p,p'γ) E_p = 0.7 to 1.8; scin

γ_1 0.110 *1*

γ_2 0.1975 *15* ϵB(E2) = 0.009

p,γ_1(θ) ~isotropic for all E_p

p,γ_2(θ) 2^-,5/2$^+$,1/2$^+$ or 2^-,3/2$^+$,1/2$^+$ possible

C.A.Barnes, Phys. Rev. 97, 1226 (1955).

Level F^{19}(n,n'γ) E_n = 4.5 scin

γ 1.34 *3*

6.10 γ attributed to O^{16} production

G.L.Griffith, Phys. Rev. 98, 579 (1955).

Level F^{19}(n,n'γ) E_n ≤ 1.8 γ scin

1.57 Threshold for 1.37γ

J.J.Van Loef, D.A.Lind, Phys. Rev. 98, 224A (1955).

F^{20} 9 11 12^s

Resonances F^{19}(n) E_n = 1 to 160 kev

E_o (kev)	J	l	Γ(kev)
27	1	1 or 2	~0.25
49.7	≥ 1	1 or 2	2.5
99.5	≥ 1	1 or 2	12.5

C.T.Hibdon, A.Langsdorf, Jr., Phys. Rev. 98, 223A (1955); verbal report.

Ne^{20} 10 10 stable

Levels F^{19}(d,nγ) E_d ≤ 2 scin

11.69

11.87

From breaks in γ yield at E_d = 1.15, 1.35

J.W.Butler, Phys. Rev. 98, 241A (1955).

Levels F^{19}(p,p'γ) γ scin

E_o	Level	Γ(kev)	σ(mb) 0.109γ	σ(mb) 0.197γ
(0.669)	(13.505)	(7.5)	20	< 0.2*
(0.780)	(13.511)	~10	< 0.2*	~ 5
(0.831)	(13.659)	(8.3)	< 0.2*	~ 8
(0.845)	(13.673)	23	~ 2	< 0.3*
(0.873)	(13.699)	(5.2)	< 0.3*	90
(0.900)	(13.725)	(4.8)	< 0.3*	~20
(0.935)	(13.758)	(6.0)	150	<1*
(1.092)	(13.907)	(<1.2)	>13	>100
(1.137)	(13.950)	(3.7)	< 0.4*	~20
1.250	14.057	~80	17	1.7
(1.290)	(14.005)	(19)	< 1*	3
1.346	14.169	4.5	17	27
1.372	14.173	15	26	40
1.422	14.222	(15)	190	7
1.610	14.400	~5	12	<2*
1.660	14.447		3	≤2*
1.700	14.485		36	17

*Upper limit of resonance portion

C.A.Barnes, Phys. Rev. 97, 1226 (1955).

Ne^{22} 10 12 stable

γ $F^{19}(\alpha,p\gamma)$ $E_\alpha = 5.3$
st 1.28 scin
1.51

R.J.Breen, M.R.Hertz, Phys. Rev. 98, 599 (1955).

Na^{22} 11 11 2.6^y

$Mg^{(24)}$ (19-Mev d,α) chem
$\epsilon/\beta^+ = 0.122$ *10* β^+/Ne^{22} atoms
Ne^{22} atoms measured by gas collection
β^+ emission rate measured by 4π GM, scin

R.A.Allen, W.E.Burcham, K.F.Chackett, G.L. Munday, P.Reasbeck, Proc. Phys. Soc. 68A, 681 (1955).

$\epsilon/\beta^+ = 0.065$ *9* e_A/β^+ a, 4π GM
Author concludes results with e_A not too reliable due to self-absorption and detection uncertainty

G.Charpak, J. phys. radium 16, 62 (1955).

Na^{23} 11 12 stable

μ +2.216124 I
$\nu(Na^{23})/\nu(H^2) = 1.723167$ *34*

H.E.Walchli, ORNL-1775 (1954).

q +0.100 *11* (or -0.836 *28*) M

M.L.Perl, I.I.Rabi, B.Senitzky, Phys. Rev. 98, 611 (1955); 97, 838 (1955).

Na^{24} 11 13 15^h

τ 14.90^h *5* differential ic

J.Tobailem, J. phys. radium 16, 48 (1955).

$Ne^{(22)}(d,\gamma)$ $E_d = 1.6$
$\sigma < 4 \times 10^{-7}$ $15^h Na^{24}$

H.R.Allan, N.Sarma, Proc. Phys. Soc. 68A, 535 (1955).

Na^{25} 11 14 62^s

τ	60^s *2*	Mg(~16-Mev n)		
γ	0.41 *1*	0.59 *1*	scin	
	0.46 *1*	0.98 *1*		

No γ with $E_\gamma \sim 0.10$-0.12

J.E.Iwersen, W.S.Koski, Phys. Rev. 98, 1307 (1955).

Mg 12

Level	$Mg(n,n'\gamma)$	$E_n \sim 2.7$	
γ	0.438	1.34	scin
	0.555	1.91	
	0.688	2.08	
	0.837	2.44	
	1.00		

L.A.Rayburn, D.L.Lafferty, T.M.Hahn, Phys. Rev. 98, 701 (1955); 95, 637A (1954).

Mg^{24} 12 12 stable

$Na^{23}(p,\gamma)$ scin, 90°
4.24 level $J = 2^+$
$(8.03\gamma)(4.24\gamma)(\theta)$ J = 2, 2, 0
$(8.11\gamma)(4.24\gamma)(\theta)$ J = 3, 2, 0
12.00 level $E_p = 0.310$ $J = 2^-$
$\Gamma(6.74\gamma) = 0.015$
$\Gamma(7.76\gamma) = 0.066$
$\Gamma(10.6\gamma) = 0.044$
p, (1.38, 2.86, 3.88, 4.24, 6.74, 7.76, 10.6 γ's) (θ)
$(10.6\gamma)(1.38\gamma)(\theta)$ J = 2, 2, 0
12.20 level $E_p = 0.515$ $J = 1^+$
$\Gamma(6.94\gamma) = 0.011$
$\Gamma(7.96\gamma) = 0.022$
$\Gamma(10.8\gamma) = 0.089$
p, (1.38, 7.96, 10.8 γ's)(θ)
$(10.8\gamma)(1.38\gamma)(\theta)$ J = 1, 2, 0
12.27 level $E_p = 0.593$ $J = 2^{-*}$
$\Gamma(7.01\gamma) = 0.016$
$\Gamma(8.03\gamma) = 0.051$
$\Gamma(10.9\gamma) = 0.027$
p, (1.38, 2.86, 3.88, 4.24, 7.01, 8.06, 10.9 γ's)(θ)
$(10.9\gamma)(1.38\gamma)(\theta)$ J = 2, 2, 0
$(8.03\gamma)(4.24\gamma)(\theta)$ J = 2, 2, 0
12.35 level $E_p = 0.679$ $J = 3^+$
$\Gamma(7.09\gamma) = 0.063$
$\Gamma(8.11\gamma) = 0.13$
$\Gamma(11.0\gamma) = 0.033$
p, (1.38, 4.24, 7.09, 8.11, 11.0 γ's)(θ)
$(11.0\gamma)(1.38\gamma)(\theta)$ J = 2, 2, 0
$(8.11\gamma)(4.24\gamma)(\theta)$ J = 3, 2, 0
* 0.593 resonance with $J = 2^-$ is distinct from that in $Na^{23}(p,\alpha)$ at this energy ($\Delta E_p < 0.002$)

P.J.Grant, J.G.Rutherglen, F.C.Flack, G.W. Hutchinson, Proc. Phys. Soc. 68A, 369 (1955).

Mg^{26} 12 14 stable

γ $Na^{23}(\alpha,\alpha'\gamma)$ $E_\alpha = 5.3$
0.43* scin
1.13
st 1.83
st 2.57
*May be due to $Na^{23}(\alpha,p\gamma)$

R.J.Breen, M.R.Hertz, Phys. Rev. 98, 599 (1955).

Al^{24} 13 11 2.1^s

τ		2.10^s *4*	$Mg^{(24)}$(20-Mev p,n)
α	($\sim10^{-2}$%)	~2	scin
β^+	w	~8.5	scin
γ	40+	1.39 *3*	scin
	32+	2.73 *6*	
	15+	4.22 *10*	
	6+	5.35 *10*	
	7+	7.12 *10*	

N.W.Glass, J.R.Richardson, Phys. Rev. 98, 1251 (1955).

Al^{25} 13 12 7.6^s

$Mg^{(24)}$ (0.225-Mev p,γ)
β^+ 3.24 *3* F-K linear(E_β>1.3) sl
No γ scin

B.Elbek, B.S.Madsen, Phil. Mag. 46, 663 (1955).

Al^{26} 13 13 6.7^s

β^+	3.21 *3*	Mg^{25}(0.391-Mev p,γ) F-K linear(E_β>1.3) sl
No γ		scin

B.Elbek, B.S.Madsen, Phil. Mag. 46, 663 (1955).

Al^{27} 13 14 stable

μ +3.638360 I

$\nu(Al^{27})/\nu(Na^{23})$ = 0.985055 *12*

H.E.Walchli, ORNL-1775 (1954).

γ	Al^{27}(n,n'γ)	E_n ~2.7	
	0.422	1.69	scin
	0.843	2.10	
	0.988		

L.A.Rayburn, D.L.Lafferty, T.M.Hahn, Phys. Rev. 98, 701 (1955); 95, 637A (1954).

γ	Al^{27}(n,n'γ)	E_n = 4.5	
	0.84 *2*		scin
	1.02 *3*		
	2.27 *6*		
	3.10 *8*		

G.L.Griffith, Phys. Rev. 98, 579 (1955).

Levels	Al^{27}(n,n')	E_n = 15.4; 90°
	3.0 *12*	scin
	4.0 *11*	
	5.8 *10*	
	8.1 *7*	

R.Ramanna, N.Veeraraghaven, P.K.Iyengar, Nuovo Cim. 10, 623 (1955).

Si^{30} 14 16 stable

γ	Al^{27}(α,pγ)	E_α = 5.3
	1.25	scin
	2.28	
	3.55	

R.J.Breen, M.R.Hertz, Phys. Rev. 98, 599 (1955).

P^{28} 15 13 0.28^s

τ		0.280^s *10*	$Si^{(28)}$(20-Mev p,n)
β^+	~50%	10.6 *4*	scin
	~50%	others (E_β<9)	
γ	75+	1.79 *2*	scin
		2.6 *2* ?	
	10+	4.44 *5*	
		4.93 *8* ?	
	10+	[6.14 *10*, 6.70 *12*, 7.04 *10*]	
	5+	7.59 *15*	

No α (<3x10^{-3}% if E_α>0.75)

N.W.Glass, J.R.Richardson, Phys. Rev. 98, 1251 (1955).

P^{31} 15 16 stable

μ +1.130500 I

$\nu(P^{31})/\nu(Na^{23})$ = 1.530366 *40*

H.E.Walchli, ORNL-1775 (1954).

Levels*	P^{31}(γ,n)	$2.5^m P^{30}$
	12.58 *7*	
	12.75 *8*	
	12.90 *8*	
	13.18 *10***	
	13.38 *10*	

Threshold = 12.33 *5*

*Sharp breaks in activation curve

**May be due to n group to 0.8 P^{30} level

R.Basile, C.Schuhl, Compt. rend. 240, 2399, 2512 (1955).

P^{32} 15 17 14.3^d

e^+/e^- < 1.3x10^{-7} $\gamma^\pm\gamma^\pm$

A.B.Milojević, V.Z.Wintersteiger, Bull. Inst. Nuclear Sci., Boris Kidrich 5, 19 (1955).

P^{34} 15 19 12.4^s

γ		2.10	$S^{(34)}$(fast n,p); scin
	w	4.0	

No 3.22 γ

E.Bleuler, H.Morinaga, Phys. Rev. 99, 658 (1955); verbal report.

S^{37} 16 21 5.0^m

Levels		$A^{(40)}$(n,α)	E_n = 14.8
	1.0+	g.s. Q = -2.5 *1*.	Argon
	1.4+	1.3 *1*	filled ic
	2.2+	2.2 *1*	
	1.2+	2.7 *1*	
	1+	3.5 ?	

σ ~30 μb for g.s. transition

E.H.Bellamy, F.C.Flack, Phil. Mag. 46, 341 (1955).

Cl^{32} 17 15 0.31^s

τ		0.306^s *4*	$S^{(32)}$(20-Mev p,n)
α	(~10^{-2}%)	2-3	scin
β^+	~50%	7.5 and others (E_β<7.5)	scin
	~50%	9.5 *4*	
γ	70%	2.21 *3*	scin
	~10%	2.77 *8* or 3.79	
	7%	4.27 *8*	
	14%	4.77 *4*	

N.W.Glass, J.R.Richardson, Phys. Rev. 98, 1251 (1955).

Cl^{34} 17 17 32.4^m

γ	1.15	$Cl^{(35)}$(p,pn); scin
	2.10	

(1.15γ)(2.10γ)(θ) J = 2^+, 2^+, 0^+

H.E.Handler, J.R.Richardson, Phys. Rev. 98, 281A (1955).

Cl^{34} 17 17 32.4^m

γ	2.10	scin
	3.22	
vw	4.0	

E. Bleuler, H. Morinaga, Phys. Rev. 99, 658 (1955); verbal report.

Cl^{35} 17 18 stable

μ +0.820905 I
$\nu(Cl^{35})/\nu(H^2) = 0.638302$ *8*

H. E. Walchli, ORNL-1775 (1954).

Cl^{36} 17 19 4.4×10^{5y}

μ +1.2840 I
$\nu(Cl^{36})/\nu(H^2) = 0.74873$ *3*

P. B. Sogo, C. D. Jeffries, Phys. Rev. 98, 1316 (1955); 99, 613A (1955)

μ +1.32 Mic
$g(Cl^{36})/g(Cl^{35}) = 1.20$ *7*
q -0.017
$q(Cl^{36})/q(Cl^{35}) = 0.2117$ *27*

L. C. Aamodt, P. C. Fletcher, Phys. Rev. 98, 1317 (1955).

A^{37} 18 19 34^d

$\epsilon_L/\epsilon_K = 0.092^{+10}_{-5}$ (theory, 0.082)
large, Xe-filled pc

M. Langevin, P. Radvanyi, Compt. rend. 241, 33 (1955).

K^{39} 19 20 stable

Levels $A^{36}(\alpha,p)$ $E_\alpha = 7.4$
g.s. Q = -1.28 *3* ppl 90°
2.48 *3*
2.87 *3*

R. B. Schwartz, J. W. Corbett, W. W. Watson, Phys. Rev. 99, 655A (1955); priv. comm.

K^{40} 19 21 1.3×10^{9y}

τ_β	1.33×10^{9y} *3*	a
τ_γ	0.133×10^{9y} *2*	a

29.6±0.7 β's/sec g K and 2.96±0.04 γ's/sec g K found from 5 K salts counted in cylindrical geometry

A. D. Suttle, Jr., W. F. Libby, Anal. Chem. 27, 921 (1955).

A^{40}/K^{40} measurements give mineral ages agreeing with those from other methods assuming:
β's/sec g K = 29.4 ± 2.7
γ's/β's = 0.090 ± 0.038

H. A. Shillibeer, R. D. Russell, Can. J. Phys. 32, 681 (1954).

K^{40} 19 21 1.3×10^{9y}

Resonances $K^{39}(n)$ E_n = 2 to 120 kev, Li(p,n)

E_0 (kev)	Γ(kev)
10	
23	
43	0.3
58	0.6
83	0.8
96	
110	

L. A. Toller, J. R. Patterson, H. W. Newson, Phys. Rev. 99, 620 (1955).

K^{42} 19 23 12.5^h

γ 10.8%* (1.53) K^{41}(pile n,γ)
*γ rate from Ra calibrated ic, total β rate from 4π counter. See also Rb^{86}

E. W. Emery, N. Veall, Proc. Phys. Soc. 68A, 346 (1955).

K^{43} 19 24 22^h

Levels $A^{40}(\alpha,p)$ $E_\alpha = 7.4$
g.s. Q = -3.36 *3* ppl 90°
0.65 *3*
1.17 *5*

R. B. Schwartz, J. W. Corbett, W. W. Watson, Phys. Rev. 99, 655A (1955); priv. comm.

Sc^{40} 21 19 0.22^s

τ	0.22^s *3*	Ca^{40}(20-Mev p,n)
β^+	9.0 *4*	scin
γ	3.75 *4*	

No α; no other strong γ

N. W. Glass, J. R. Richardson, Phys. Rev. 98, 1251 (1955).

Sc^{45} 21 24 stable

$Sc^{45}(p,p'\gamma)$ $E_p \leq 2.75$
No γ with $E_\gamma < 0.6$ scin

H. Mark, C. McClelland, C. Goodman, Phys. Rev. 98, 1245 (1955).

Sc^{46} 21 25 84^d

$(1.12\,\gamma)(0.89\,\gamma)(\theta)$ J = 4, 2, 0 scin
Graph of $\eta(\theta)$ given $(\pi/2 < \theta < \pi)$; $\eta(\pi) = 0.162$

T. Hayashi, M. Kawamura, A. Aoki, J. Phys. Soc. Japan 10, 334 (1955).

Ti^{49} 22 27 stable

Resonances $Ti^{48}(n)$ E_n = 1 to 55 kev

E_0 (kev)	J	l	Γ(kev)
18	1/2	0 or 1	~4
38	1/2	0	1.2
53	1/2	0	2.5

C. T. Hibdon, A. Langsdorf, Jr., Phys. Rev. 98, 223A (1955); verbal report.

Ti^{51}
22 29
5.8^m

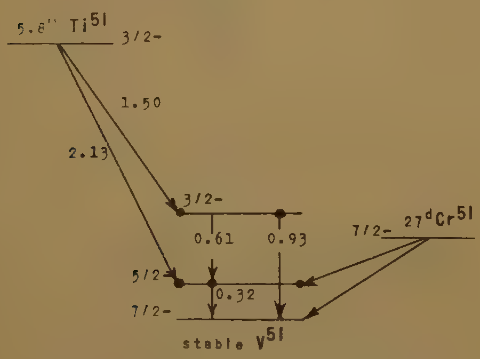
β^- 2.13 *3* F-K linear (E_β >0.7) sl
γ 100+ 0.32 scin
1.5+ 0.45-0.7 $\gamma\gamma$ scin
(0.32 γ)(>1.9 β) (0.32 γ)(0.45 < E_γ < 0.7)
No β^- with E_{β^-} > 2.1 (< 5%)
No 0.93 γ (< 6+)
$V^{(51)}$ (fast n,p) chem; Ti^{50}(d,p)

Th.Mayer-Kuckuk, H.Daniel, Z.Naturf. 10a, 168 (1955).

$Ti^{(50)}$ (14-Mev d,p)
β^- 2.17 *4* scin
γ 100+ 0.325 scin
6+ 0.935 *15*
(2.17 β)(0.325 γ)
No 2.55 β (< 20%) No 0.48 γ (< 3+)

M.J.Sterk, R.H.Nussbaum, A.H.Wapstra, Physica 21, 441 (1955).

τ 5.80^m *3* Ti^{50}(pile n,γ)
β^- 1.50 *5* scin
2.13 *3* F-K linear (E_β > 1.5)
γ 95.8+ 0.323 *2* scin
1.4+ 0.605 *4*
4.2+ 0.928 *5*
(1.50 β)(0.928 γ) (2.13 β)(0.323 γ)
(0.323 γ)(0.605 γ) No other $\gamma\gamma$
No 0.48 γ (< 0.4+)



M.E.Bunker, J.W.Starner, Phys. Rev. 97, 1272 (1955).

V^{48}
23 25
16.2^d

β^+ 0.694 *6* sm
No 2.01 β^+ (< 0.1%) No other β^+

L.E.Killion, Washington University, Dissertation Abstr. 15, 858 (1955).

V^{50}
23 27
$>3\times10^{15}y$

μ +3.34128 I
$\nu(V^{50})/\nu(H^2)$ = 0.649518 *8*

H.E.Walchli, ORNL-1775 (1954).

V^{51}
23 28
stable

Level $V^{(51)}$(p,p'γ) $E_p \geq 1.3$; γ scin
0.325

H.Mark, C.McClelland, C.Goodman, Phys. Rev. 98, 1245 (1955).

Cr^{48}
24 24
23^h

τ 24^h *1* Ti^{46}(50-Mev α, 2n) chem
γ 100+ 0.118 scin
~100+ 0.307
(0.118 γ)(0.307 γ) Σ scin
No other γ No β^+ (< 2%) p 16.2^dV

R.K.Sheline, J.R.Wilkinson, Phys. Rev. 99, 165 (1955); 98, 1538 (1955).

Cr^{51}
24 27
27^d

γ 9.8% (0.32) $\alpha_K = 1.5\times10^{-3}$* M1 scin
$x\gamma/x$ = 0.098

M.E.Bunker, J.W.Starner, Phys. Rev. 97, 1272 (1955); *priv. comm.

Cr^{53}?
24 29
stable

γ Cr^{53}(p,?γ) E_p = 1.3; γ scin
0.155 $\epsilon B(E2)$ = 0.015

H.Mark, C.McClelland, C.Goodman, Phys. Rev. 98, 1245 (1955).

Mn^{55}
25 30
stable

Levels Mn^{55}(p,p'γ) E_p = 2.1; γ scin
0.131* $\epsilon B(E2)$ = 0.087
0.975**
*Yield curve given for E_p = 0.55 to 2.5
**May be due to Mn^{55}(p,nγ)

H.Mark, C.McClelland, C.Goodman, Phys. Rev. 98, 1245 (1955).

Fe
26

Levels Fe(n,n') E_n = 4.4
0.08+ g.s. ppl 90°
0.036+ 0.8
0.021+ 2.0
0.012+ 2.6
0.020+ 3.0
+barns/sterad at 90°

B.Jennings, J.Weddell, I.Alexeff, R.L.Hellens, Phys. Rev. 98, 582 (1955); 95, 636A (1954); 99, 621 (1955).

γ Fe(n,n'γ) E_n = 4.5
0.85 *2* scin
1.20 *3*
1.73 *4*
2.05 ⎤
2.50 ⎦ not clearly resolved
3.52 *9*

G.L.Griffith, Phys. Rev. 98, 579 (1955).

Fe_{26} Levels Fe(n,n') E_n = 15.4 scin 90°

~1.9
4.5 *11*
5.8 *10*
7.6 *8*

R.Ramanna, N.Veeraraghavan, P.K.Iyengar, Nuovo Cim. 10, 623 (1955).

Fe^{55} 26 29 2.9^y Levels $Mn^{55}(p,n\gamma)$ E_p=2.1; γ scin

0.420
0.505
0.650 ?
0.975*

*May also be due to $Mn^{55}(p,p'\gamma)$

H.Mark, C.McClelland, C.Goodman, Phys. Rev. 98, 1245 (1955).

Fe^{56} 26 30 stable γ $Fe^{(56)}(n,n'\gamma)$ E_n = 1.77

(0.85) J = 2+ n,$\gamma(\theta)$

J.J.Van Loef, D.A.Lind, Phys. Rev. 98, 224A (1955); 99, 621 (1955); verbal report.

Resonances $Mn^{55}(p,p' + 0.131\gamma)$ γ scin

Graph of yield given for E_p = 0.55 to 2.5

H.Mark, C.McClelland, C.Goodman, Phys. Rev. 98, 1245 (1955).

Fe^{57} 26 31 stable Level $Fe^{57}(p,p'\gamma)$ E_p=0.58; γ scin

(0.137) ϵB(E2) ~0.015

H.R.Lemmer, O.J.A.Segaert, M.A.Grace, Proc. Phys. Soc. 68A, 701 (1955).

Co^{56} 27 29 77^d $|\mu|$ 2.8 *9** $\gamma(\theta,T)$; scin

γ (0.845) ΔJ = 2
(1.24) ΔJ = 2, 0
(1.75) ΔJ = 1
(2.30)
(2.60) ΔJ = 1
(3.25) ΔJ = 0, 2

*Assuming J = 4

L.J.Gallaher, C.Whittle, J.A.Beun, A.N.Diddens C.J.Gorter, M.J.Steenland, Physica 21, 117 (1955).

Co^{57} 27 30 270^d $Fe^{(56)}$(18-Mev d,n) chem

γ 0.0144 *1* α = 15 ± 1 pc, scin
(0.123)
(0.137)

No β^+ (< 0.08% from absence of $\gamma^{\pm}$) scin
(0.0144 γ)(0.123 γ) delay = 1.0×10^{-7s} *1*
x(0.123 γ+ 0.137 γ) delay < 5×10^{-8s}
Delay reversal shows 0.014 γ follows 0.123 γ
No ϵ to g.s. or 0.014 level in Fe^{57} (< 14%)
x/γ, x γ/γ scin

H.R.Lemmer, O.J.A.Segaert, M.A.Grace, Proc. Phys. Soc. 68A, 701 (1955).

Co^{58} 27 31 72^d g(Co^{58}g.s.)/g(Co^{60}g.s.) = constant for all temperatures $\gamma(\theta,T)$; scin
μ(Co^{58}g.s.)/μ(Co^{60}g.s.) calculated for different assumptions of spin and interaction

J.C.Wheatley, D.F.Griffing, R.D.Hill, Phys. Rev. 99, 334 (1955).

Co^{59} 27 32 stable $Co^{59}(p,p'\gamma)$ E_p ≤ 2.75

No γ with E_γ < 0.6 scin

H.Mark, C.McClelland, C.Goodman Phys. Rev. 98, 1245 (1955).

Co^{60} 27 33 5.2^y $|\mu|$ 4.3 *2** $\gamma(\theta,T)$; scin

(1.17 γ+ 1.33 γ)(θ,T) J = 4, 2, 0
*Assuming J(Co^{60})g.s. = 5

O.J.Poppema, M.J.Steenland, J.A.Beun, C.J. Gorter, Physica 21, 233 (1955).

(1.17 γ)(1.33 γ)(θ) J = 4, 2, 0 Both γ's E2

S.Colombo, A.Rossi, A.Scotti, Nuovo Cim. 1, 522 (1955).

Ni^{59} 28 31 7.5×10^{4y} Resonances Ni^{58}(n) E_n = 1 to 160 kev

E_o(kev)	J	l	Γ(kev)
16	1/2	0 or 1	~2
65	1/2	0	2.9
144	1/2	0	~4
160	1/2	0	~4

C.T.Hibdon, A.Langsdorf, Phys. Rev. 98, 223A (1955); verbal report.

Cu^{63} 29 34 stable μ +2.220586 I

$\nu(Cu^{63})/\nu(Na^{23})$ = 1.002008 *16*

H.E.Walchli, ORNL-1775 (1954).

Level $Cu^{63}(p,p'\gamma)$ E_p > 2.2; γ scin

0.67 *2*

C.E.Weller, J.C.Grosskreutz, Phys. Rev. 99, 655A (1955); priv. comm.

Cu^{64} 29 35 13^h τ 12.80^h *3* differential ic

J.Tobailem, J. phys. radium 16, 48 (1955).

Cu^{65} 29 36 stable μ +2.378967 I

$\nu(Cu^{65})/\nu(H^1)$ = 0.283954 *4*

H.E.Walchli, ORNL-1775 (1954).

Zn^{61} 30 31 1.5^m

τ 1.5^m *1* Ni^{58}(18-Mev α, n) chem
β^+ 4.9 *5* scin
No strong γ scin
p 3.3^hCu

J.B.Cumming, Phys. Rev. 99, 1645A (1955).

Zn^{64} 30 34 stable

Cu^{63}(p,γ) E_p = 1.9

γ	31+	0.78 *2*	40+	2.07 *2*	scin
	100+	0.97 *2*	40+	2.27 *2*	
	17+	1.16 *2*		3.84 ?	
	29+	1.30 *2*		5.64	

Many others with $5.6 < E_\gamma < 10$
(0.97 γ)(0.78 γ, 1.16 γ, 1.30 γ, 2.07 γ, 2.4? γ)

C.E.Weller, J.C.Grosskreutz, Phys. Rev. 99, 655A (1955); priv. comm.

Zn^{66} 30 36 stable

Cu^{65}(p,γ) E_p = 1.9

γ	0.83 *2*	2.75 *2*	scin
	1.04 *2*	3.76 *2*	
	1.37 *2*	4.12 *2*	
	2.17 *2*	4.33 *2*	
	2.41 ?	4.52 *2*	

Many others with $4.5 < E_\gamma < 10$
(1.04 γ)(0.83 γ, 1.03 γ, 1.37 γ, 2.17 γ, 2.75 γ)
No 3.41 γ

C.E.Weller, J.C.Grosskreutz, Phys. Rev. 99, 655A (1955); priv. comm.

Ga^{69} 31 38 stable

μ +2.010809 I
$\nu(Ga^{69})/\nu(Na^{23})$ = 0.907349 *20*

H.E.Walchli, ORNL-1775 (1954).

Ga^{71} 31 40 stable

μ +2.554922 I
$\nu(Ga^{71})/\nu(Na^{23})$ = 1.152872 *8*

H.E.Walchli, ORNL-1775 (1954).

As^{70} 33 37 52^m

τ		47^m *2*	Cu(125-Mev N^{14})	chem
β^+	67+	1.35 3	F-K linear	sт
	33+	2.45 4	F-K linear	
γ		1.07 4		

Other peaks at 1.5, 2.15, 2.75, 3.25

A.E.Souch, Proc. Phys. Soc. 68A, 760 (1955).

As^{76} 33 43 26.5^h

β^-	2.5%	0.36		sl
	16.0%	1.76		
	31.0%	2.41		
	50.5%	2.965 *10*	ΔJ = 2, yes shape	
γ	100+	0.549 *4*		scin, sl pe
	20+	0.643 *6*		
	21+	1.200 *6*		
	2+	1.402 *15*		
	4+	2.053 *18*		

(1.76 β)(1.20 γ) (2.41 β)(0.55 γ) scin
(0.55 γ)(0.64 γ, 2.05 γ, 1.4 γ?) scin
(1.20 γ)(1.40 γ) No γ ($1.7 < E_\gamma < 1.8$)

J.D.Kurbatov, B.B.Murray, M.Sakai, Phys. Rev. 98, 674 (1955).

As^{77} 33 44 38.7^h

$As^{(76)}$(pile n,γ) chem

γ	0.13+	0.086 *1*	scin
	0.26+	0.160 *5*	
	2.5+	0.245 *2*	
	0.8+	0.525 *5*	

No γ with $0.02 < E_\gamma < 0.08$ (< 0.2+)
0.033 γ attributed to iodine escape peak
0.020 γ attributed to external bremsstrahlung
No (0.086 γ)($0.08 < E_\gamma < 0.7$)
No (0.160 γ)($0.03 < E_\gamma < 0.4$) (0.245 γ)(0.270 γ?)
+Photons per 100 disintegrations

H.Langevin, J. phys. radium 16, 238 (1955).

Se^{75} 34 41 127^d

As^{75}(22-Mev d, 2n) chem
J 5/2 OCSe^{75} Mic
q +1.1 *2*
$q(Se^{75})/q(Se^{79})$ = 1.2578 *6*

L.C.Aamodt, P.C.Fletcher, Phys. Rev. 98, 1224 (1955); 94, 789A (1954).

Se^{77} 34 43 stable

μ +0.5324786 I
$\nu(Se^{77})/\nu(H^2)$ = 1.242100 *19*

H.E.Walchli, ORNL-1775 (1954).

Br^{76} 35 41 17^h

τ	17.5^h		Kr^{76} source
γ	0.20 ?	0.85 ?	scin
	0.56	~1.2	(double)
	0.66		

A 1.86 γ with $\tau \sim 30^h$ was observed in a ms sample of Kr^{76} (+Br^{76})

S.Thulin, Arkiv Fysik 9, 137 (1955).

Br^{79} 35 44 stable

μ +2.098991 I
$\nu(Br^{79})/\nu(Na^{23})$ = 0.947140 *9*

H.E.Walchli, ORNL-1775 (1954).

Br^{81} 35 46 stable

μ +2.262597 I
$\nu(Br^{81})/\nu(Na^{23})$ = 1.020965 *14*

H.E.Walchli, ORNL-1775 (1954).

Kr^{76} 36 40 9.7^h

$Br^{(79)}$(60-Mev p, 4n) chem; ms

τ	~10.5^h		
γ	0.028	0.316	scin
	0.093	0.40	
	0.267		

No β^+ scin

S.Thulin, Arkiv Fysik 9, 137 (1955).

Kr^{77} 36 41 1.1^h

Br(79) (50-Mev p,3n) chem; ms

τ		1.2^h		
β+	7+	0.85		sl
	32+	1.67		
	61+	1.86		
			K/LM	
γ	~36*	0.0242 *5*	1.3	sl ce
	100*	0.1076 *8*	3.6	
	45*	0.1311 *10*	8.2	
	26*	0.1493 *10*	~5	
	~0.2*	0.246 *3*		
	~0.2*	0.281 *3*		
	~0.4*	0.313 *1*		

S.Thulin, Arkiv Fysik 9, 137 (1955).

γ	0.665	scin
	0.870	

(0.665 γ)(ce_K 0.1312 γ, ce_K 0.149 γ, ~0.14 γ)
No (0.665 γ)(ce_K 0.108 γ)
ϵ_K/β^+ = 0.2
*ce_K per 1000 β^+

S.Thulin, Arkiv Fysik 9, 137 (1955).

Kr^{79} 36 43 34.5^h

Br(79) (25-Mev d,2n) chem; ms

β+	~7+	0.325 *20*				sl
	93+	0.598 *5*	F-K linear			
			K/LM			K/LM
γ	100*	0.0445	7.2	9*	0.3069	9.4
	4*	0.0840	5 ?	0.2*	0.3455	
	15*	0.1361	8.6	3*	0.3892	
	1*	0.1805		15*	0.3977	10
	6*	0.2086	6.9	0.3*	0.5259	
	17*	0.2173	10.6	9*	0.6064	7.8
	51*	0.2613	8.0	0.4*	0.8334	
	6*	0.2998	10.8			sd ce

*Relative intensity ce_K

(ce_K 0.044 γ) γ delay < 0.3$^{\mu s}$
No (ce_K 0.084 γ)(E_γ > 0.3)   No (0.598 β)γ
(ce_K 0.044 γ) / e_{AK} = 0.03 β^+/e_{AK} = 0.25   sl
ϵ_K/β^+ = 10.8 ± 2.0 (recalculated using K fluorescence yield = 0.63)

S.Thulin, J.Moreau, H.Atterling, Arkiv Fysik 8, 229 (1954).

Br(79) (d,2n) chem; ms

β+	9+	0.330	sl, sl βγ
	91+	(0.598)	sl

(0.330 β)(E_γ > 0.08)
(ce_K 0.044 γ)(E_γ ≤ 0.22)
(ce_K 0.084 γ)(E_γ > 0.04)
(ce_K 0.136 γ)(E_γ ≤ 0.27)
(ce_K 0.261 γ)(E_γ ≤ 0.30)
No (ce_K 0.606 γ)(E_γ > 0.04)
Decay scheme is proposed

S.Thulin, Arkiv Fysik 9, 137 (1955).

Kr^{85} 36 49 10.3^y

J	9/2		U(n,f) S
μ	-1.001	from μ_{85}/μ_{83} = 1.035 *2*	
q	+0.25	from q_{85}/q_{83} = 1.66 *10*	

E.Rasmussen, V.Middelboe, Z. Phys. 144, 160 (1955).

U(n,f) chem; ms

β−	0.672 *7*	ΔJ = 2, yes shape	sl
γ	0.517 *5*		scin

S.Thulin, Arkiv Fysik 9, 137 (1955).

Kr^{85} 36 49 4.4^h

U(n,f) chem; ms

β−	0.824 *8*		sl
γ	(0.305)	K/LM = 6.2	sd ce

S.Thulin, Arkiv Fysik 9, 137 (1955).

Kr^{87} 36 51 78^m

U(n,f) chem; ms

β−	25%	1.3			sl βγ
	≤10%	~3.3			
	≥65%	(3.8)			
γ	100+	0.403 *4*	≤6+	2.05 *5*	scin
	19+	0.847 *9*	42+	2.57 *4*	
		1.75 ?			

(1.3 β)(2.57 γ)   (1.3 β, 3.8 β)(0.403 γ)   sl, scin
(~3.3 β)(0.847 γ)
(0.403 γ)(2.57 γ)   No (0.403 γ)(0.847 γ)   scin

S.Thulin, Arkiv Fysik 9, 137 (1955).

Kr^{88} 36 52 2.77^h

U(n,f) chem; ms

γ	20+	0.166			sl ce, scin
	100+	0.191	40+	1.55	
	14+	0.36		1.85 ?	
	65+	0.845	≤50+	2.19	
	<10+	1.19 ?	100+	2.40	

(ce_K 0.191 γ)/(ce_K 0.028 γ) ~ 0.05
(0.191 γ)(~0.5 β, ~2.5 β)   (ce_K 0.028 γ)(~0.5 β)
(0.191 γ)(2.19 γ)   (ce 0.028 γ)(0.166 γ, 2.19 γ)
No (ce 0.028 γ)(0.191 γ, 2.40 γ)
No (0.191 γ)(0.845 γ, 2.40 γ)

S.Thulin, Arkiv Fysik 9, 137 (1955).

Rb^{85} 37 48 stable

μ	+1.348217	I

$\nu(Rb^{85})/\nu(H^2)$ = 0.628985 *5*

H.E.Walchli, ORNL-1775 (1954).

Rb^{86} 37 49 18.7^d

τ	18.64^d *4*	U(n,f) ion chem

Followed 8 samples for 7 to 9 half-lives

J.B.Niday, Phys. Rev. 98, 42 (1955).

Rb^{86} 37 49 18.7^d

τ 18.66^d 3 $Rb^{(85)}$(pile n,γ) chem
γ 8.5%* (1.08) 4π β, ic
Observed for ~4 half-lives
*γ rate from Ra calibrated ic, total β rate from 4π counter. See also K^{42},

E.W.Emery, J.E.S.Bradley, N.Veall, Nature 175, 34 (1955); E.W.Emery, N.Veall, Proc. Phys. Soc. 68A, 346 (1955).

$Rb^{(85)}$(pile n,γ) chem
β^- 15% ~0.73 F-K linear sd $\beta\gamma$
85% 1.770 10 $\Delta J = 2$, yes shape sd
γ 1.08 scin

J.Laberrique-Frolow, M.Lederer, J. phys. radium 16, 346 (1955).

β^- 15% 0.694 sπ
5% (0.832)
80% 1.767 $\Delta J = 2$, yes shape
γ w 0.935 sπ pe
1.083

L.E.Killion, Washington University, Dissertation Abstr. 15, 858 (1955).

Rb^{87} 37 50 6.2x10^{10y}

μ +2.741451 I
$\nu(Rb^{87})/\nu(Na^{23}) = 1.237041$ 8

H.E.Walchli, ORNL-1775 (1954).

Rb^{88} 37 51 17.8^m

γ 60+ 0.908 U(n,f) chem; scin
100+ 1.85 <10+ 2.76
4+ 2.18 3 0.2+ 4.2 1

S.Thulin, Arkiv Fysik 9, 137 (1955).

Sr^{90} 38 52 28^y

τ 27.7^y 4 U(n,f); 4π pc,ms

D.M.Wiles, R.H.Tomlinson, Can J. Phys. 33, 133 (1955).

τ ~30^y Specific activity; ms

G.W.Reed, Phys. Rev. 98, 1327 (1955).

τ 28.4^y

K.F.Flynn, L.E.Glendenin, E.P.Steinberg, quoted by G.W.Reed, Phys. Rev. 98, 1327 (1955).

Y^{88} 39 49 105^d

$Sr^{(88)}$(18-Mev d,2n) chem
$(0.91\gamma)(1.87\gamma)(\theta)$ J = 3, 2, 0 or 3, 1, 0
$(0.91\gamma)(1.87\gamma)$( ) consistent with
J = 3^-, 2^+, 0^+ or J = 3^-, 1^+, 0^+ scin

G.R.Bishop, J.P.Perez y Jorba, Phys. Rev. 98, 89 (1955).

Y^{88} 39 49 0.4^{ms}

τ 3.7x10^{-4s} 3 85^{d}Zr source
No β^+ (no $\gamma^\pm$) scin
γ 0.395 5 K/LM = 8.4 scin
α~0.02 E3
τ from xγ delay

E.K.Hyde, M.G.Florence, A.E.Larsh, Phys. Rev. 97, 1255 (1955).

Y^{90} 39 51 64.2^h

β^- 100% 2.26 sπ
No other β with $0.5 < E_\beta < 2.26$
No photons with $E_\gamma \sim 1.75$ (<5x10^{-4}%) scin
ce corresponding to $E_\gamma = 1.75$ (0.005%) and nuclear pairs (~0.02%) suggest $0^+ \rightarrow 0^+$ sl

O.E.Johnson, R.G.Johnson, L.M.Langer, Phys. Rev. 98, 1517 (1955).

Y^{91} 39 52 57^d

τ 57.5^d 5 U(n,f) chem
β^- 0.36 2 a $\beta\gamma$
(1.55) 4π pc
γ 0.22% 1.190 5 scin, ic
No other γ's with $0.1 < E_\gamma < 2.0$ (<0.01%)

B.Kahn, W.S.Lyon, Phys. Rev. 98, 58 (1955).

Zr 40

Zr(p,p'γ) $E_p \leq 2.75$
No γ with $E_\gamma < 0.6$ scin

H.Mark, C.McClelland, C.Goodman, Phys. Rev. 98, 1245 (1955).

γ Zr(n,?γ) $E_n = 4.5$
0.92 scin
2.20
3.27

G.L.Griffith, Phys. Rev. 98, 579 (1955).

Zr^{95} 40 55 65^d

γ 0.722 $\alpha_K \sim 1.6$x10^{-3} sl ce,pe
E2,M1

R.C.Rohr, R.D.Birkhoff, Phys. Rev. 98, 1266 (1955).

Nb^{90} 41 49 15^h

Zr(20-Mev p) chem
β^+ 1.7 1 scin
γ 10+ 0.140 scin
28+ 1.14
17+ 2.20
(K x ray)/(0.14γ) = 0.8
(0.14γ, 1.14γ) $\gamma^\pm$ (0.14γ)(1.14γ)
No (2.2γ)(K x ray, 0.14γ, $\gamma^\pm$, 1.14γ)
Absence of 2.2γ after fast chem and absence of (2.2γ)(K x ray, $\gamma^\pm$) imply 1^m > delay > $5^{\mu s}$

H.B.Mathur, E.K.Hyde, Phys. Rev. 98, 79, 261A (1955).

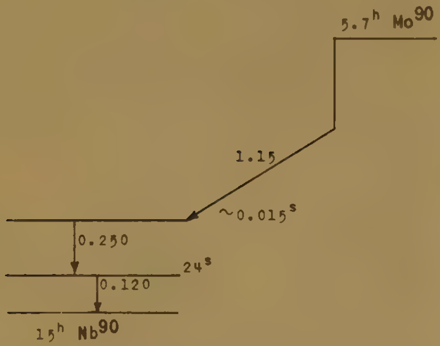
Nb^{90}
41 49
24^s

τ	24^s *3*	5.7^hMo source	chem
γ	0.120	$\alpha_K \sim 0.5$ x/γ	scin
		K/LM = 3.6 ± 0.2	sd ce
d 5.7^hMo			

H.B.Mathur, E.K.Hyde, Phys. Rev. 98, 79, 261A (1955).

Nb^{90}
41 49
0.015^s

τ	0.015^s *5*	5.7^hMo source	
γ	0.250	K/LM = 5.2 ± 0.2	sd, scin



H.B.Mathur, E.K.Hyde, Phys. Rev. 98, 79, 261A (1955).

Nb^{91}
41 50
62^d

		$Zr^{(90)}$ (16-Mev d,n)	chem
ϵ	Zr K x ray		crit a
No β^+ (<0.1%)			scin
$\gamma(Nb^{91})$ 10+	0.104 *1*	K/LM = 2.1	sl ce, scin
$\gamma(Zr^{91})$ 51+	1.21		scin
(1.21 γ)(Zr K x ray)			

R.W.Hayward, D.D.Hoppes, H.Ernst, Phys. Rev. 98, 231A (1955); verbal report.

Nb^{92}
41 51
10^d

		$Zr^{(91)}$ (14-Mev d,n)	chem
ϵ	Zr K x ray		crit a
No β^+ (<0.01%)			scin
γ 1.3+	0.900		scin
97.8+	0.934		
2.2+	1.83		
(0.93 γ, 1.83 γ)(Zr K x ray)			
(0.90 γ)(0.93 γ)(θ)		$\eta(\pi)$ = 0.21	

R.W.Hayward, D.D.Hoppes, H.Ernst, Phys. Rev. 98, 231A (1955); verbal report.

Nb^{93}
41 52
stable

q	-0.4 *3*	S

D.R.Speck, F.A.Jenkins, Phys. Rev. 98, 282A (1955).

q	-0.2 *1*	S

K.Murakawa, Phys. Rev. 98, 1285 (1955).

	Nb^{93} (p,p'γ)	$E_p \leq 2.75$
No γ with E_γ < 0.6		scin

H.Mark, C.McClelland, C.Goodman, Phys. Rev. 98, 1245 (1955).

Nb^{93}
41 52
stable

Level	Nb^{93} (p,p'γ)	E_p = 2.75 to 4.0	
0.71	E2 from $\sigma(E_p)$		γ scin

D.M.Van Patter, M.A.Rothman, C.E.Mandeville, C.P.Swann, J.Franklin Inst. 259, 261 (1955).

Nb^{94}
41 53
2.7×10^{4y}

τ	1.8×10^{4y} *4*	Nb^{93} (th n,γ)	chem
β^-	0.5-0.6		a
γ	0.726		scin
	0.903		
	1.65		

M.A.Roller, E.Saeland, A.Morpurgo, A.Cagliaris, Acta Chem. Scandinavica 9, 57 (1955).

Mo^{90}
42 48
5.7^h

		Nb^{93} (80-Mev p,4n)	chem
β^+	1.15 *10*		scin
γ	(0.120)		See 24^sNb
	(0.250)		See 0.015^sNb
1.14 γ assigned to 15^hNb			scin
No (0.120 γ)(0.250 γ, $\gamma^\pm$)			scin
(0.250 γ) $\gamma^\pm$ delay 0.01-0.02^s			
p 15^hNb chem			

H.B.Mathur, E.K.Hyde, Phys. Rev.98, 79 (1955).

Mo^{94}
42 52
stable

Level	Nb^{93} (p,γ)	E_p = 2.75 to 4.0	
	0.87		γ scin

D.M.Van Patter, M.A.Rothman, C.E.Mandeville, C.P.Swann, J.Franklin Inst. 259, 261 (1955).

Mo^{95}
42 53
stable

Level	$Mo^{(95)}$ (p,p'γ)	E_p = 2.9; γ scin
	0.212 *3*	$\epsilon B(E2)$ = 0.041

P.N.Stelson, F.K.McGowan, Phys. Rev. 99, 112 (1955).

Level	$Mo^{(95)}$ (p,p'γ)	E_p = 2.5; γ scin
	0.199	$\epsilon B(E2)$ = 0.057

H.Mark, C.McClelland, C.Goodman, Phys. Rev. 98, 1245 (1955); 99, 617A (1955).

Mo^{98}
42 56
stable

Level	$Mo^{(98)}$ (p,p'γ)	E_p = 3.0; γ scin
	0.77 *1*	$\tau = 2.5^{\mu\mu s*}$ (α = 0.001)

*Yield not corrected for Mo^{96} 0.776 γ

P.H.Stelson, F.K.McGowan, Phys. Rev. 99, 112 (1955).

Mo^{99}
42 57
68^h

(0.74 γ)(0.14 γ, 0.18 γ) delay 3.5 ± 0.3 × 10^{-9s} scin

P.Lehmann, J.Miller, Compt. rend. 240, 1525 (1955).

Mo^{100} 42 58 stable

Level $Mo^{(100)}(p,p'\gamma)$ $E_p = 3.0$; γ scin
0.540 *7* $\tau = 9.5^{\mu\mu s}$ $(\alpha = 0.004)$

P.H.Stelson, F.K.McGowan, Phys. Rev. 99, 11*2* (1955).

Level $Mo^{(100)}(p,p'\gamma)$ $E_p = 2.5$; γ scin
0.525

H.Mark, C.McClelland, C.Goodman, Phys. Rev. 98, 1245 (1955).

$Ru^{<94}$ 44

τ	52^s *10*	Mo (42-Mev α)	chem
β			scin
γ (or $\gamma^{\pm}$)			

Mass assignment from yield as $f(E_\alpha)$

A.H.W.Aten, Jr., T.de Vries-Hamerling, Physica 21, 544 (1955).

Ru^{103} 44 59 40^d

β^-	28%	0.128 *4*	sl
	70%	0.202 *2*	
	~1%	0.374 *20* ?	
	~1%	0.695 *15*	
γ		0.055	scin
		0.297	sl pe
		0.323	sl pe
		0.366	sl pe
		0.498	scin
		0.610	scin

H.H.Forster, A.Rosen, Nuovo Cim. 1, 972; Phys. Rev. 98, 1172 (1955); verbal report.

Rh^{102} 45 57 210^d

ϵ		Ru K x ray			pc, crit a
γ	54+	0.125 *3*			scin
	58+	0.200 *4*	~15+	0.72 *2*	
	80+	0.475 *5*	<10+	0.79 *2*	
	26+	0.635 *5*	56+	1.08 *1*	

Other γ's with $E_\gamma > 1.1$ No 0.086 γ, 0.353 γ
$(0.475\,\gamma)/\beta^+ > 20$ $(0.475\,\gamma)/(\text{K x ray}) = 0.8$

P.Avignon, Compt. rend. 240, 176 (1955).

Ru (28-Mev d) chem

γ	0.123	scin
	0.195	
	0.479	
	0.633	
	0.710	
	0.880 ?	
	1.07 Double?	
	1.50	
	1.72	

No 0.086 γ, 0.353 γ

D.Bès, H.Bosch, Compt. rend. 240, 294 (1955).

Rh^{102} 45 57 210^d

γ	0.125	scin
	0.195	
	0.475	
	0.630	
	0.720	
	0.780	
	1.08	

$(0.125\,\gamma)(0.195\,\gamma)$ x(all γ's)
$(0.475\,\gamma)/\beta^+ = 10$ $\gamma\gamma^{\pm}(\theta)$ scin

L.Dick, R.Foucher, N.Perrin, H.Vartapetian, Compt. rend. 240, 1335 (1955).

Rh^{103} 45 58 stable

μ -0.08791 *7** Metallic Rh I
$\nu(Rh^{103})/\nu(H^2) = 0.205574$ *7*
*Corrected for Knight shift for metal

P.B.Sogo, C.D.Jeffries, Phys. Rev. 98, 1316, 265A (1955).

Levels $Rh^{103}(p,p'\gamma)$ $E_p = 2.1$ to 3.9

0.30 level J = 3/2⁻ $p,\gamma(\theta)$

γ 0.305 *5* $\epsilon B(E2) = 0.20$ scin
E2/M1=0.032 or 1.37 $p,\gamma(\theta)$

0.36 level J = 5/2⁻ $p,\gamma(\theta)$

γ 6+ 0.065 *3*
100+ 0.365 *5* $\epsilon B(E2) = 0.36$ scin

P.H.Stelson, F.K.McGowan, Phys. Rev. 99, 112, 127 (1955).

Rh^{103} 45 58 57^m

γ 0.0402 *5* $\alpha_K = 40$ d 17^dPd
K/L = 0.09 sl ce

P.Avignon, A.Michalowicz, R.Bouchez, J. phys. radium 16, 404 (1955).

Rh^{105} 45 60 36.5^h

$Ru^{(104)}$ (pile n,$\gamma\beta$) chem

β^-	~65%	0.247 *5*	F-K linear	sd $\beta\gamma$
	~35%	0.560 *5*		sd
γ	~25%	0.310 *5*	$\alpha = 0.02$	sd ce

No 0.063 γ (photons <0.1%) scin, sd ce

J.Laberrique-Frolow, Compt. rend. 240, 287 (1955).

Pd^{103} 46 57 17^d

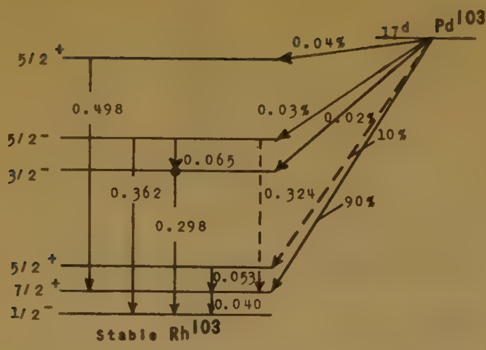
Rh^{103} (28-Mev d,2n) chem

γ	2.1+	0.0402 *5*	See 57^mRh	scin
	0.005+	0.0530	$\alpha_K > 10^4$ K/L~1	sl ce
	0.04+	0.065 *1*		
	0.3+	0.298 *2*		
	~0.1+	0.324 *2*	α_K~10 K/L~10	
	2.1+	0.362 *3*		
	0.45+	0.498 *4*		

+Photons/100 Rh K x rays
No 0.26 γ, no 0.611 γ

(CONTINUED)

Pd^{103}
46 57
17^d



P.Avignon, A.Micnalowicz, R.Bouchez, J. phys. radium 16, 404; 14, 637 (1955).

Pd^{104}
46 58
stable

Level $Pd^{104}(\alpha,\alpha'\gamma)$ E_α = 6.0; γ scin
0.550 *8* $\tau = 9^{\mu\mu s}$ (α = 0.004)

G.M.Temmer, N.P.Heydenburg, Phys. Rev. 98, 1308 (1955); 99, 617A (1955).

Level $Pd^{(104)}(p,p'\gamma)$ E_p = 3.5; γ scin
0.575 *10* $\tau = 8.3^{\mu\mu s}$ (α = 0.004)

P.H.Stelson, F.K.McGowan, Phys. Rev. 99, 112 (1955).

Pd^{105}
46 59
stable

γ $Pd^{105}(\alpha,\alpha'\gamma)$ E_α = 6.0; γ scin
0.266 *5* $\epsilon B(E2)$ = 0.013
0.433 *7* = 0.18

G.M.Temmer, N.P.Heydenburg, Phys. Rev. 98, 1308 (1955); 99, 617A (1955).

γ $Pd^{105}(p,p'\gamma)$ E_p = 2.5; γ scin
0.270 $\epsilon B(E2)$ = 0.0084
0.430 = 0.057

H.Mark, C.McClelland, C.Goodman, Phys. Rev. 98, 1245 (1955); 99, 617A (1955).

Pd^{106}
46 60
stable

Level $Pd^{106}(\alpha,\alpha'\gamma)$ E_α = 6.0; γ scin
0.510 *8* $\tau = 11^{\mu\mu s}$ (α = 0.006)

G.M.Temmer, N.P.Heydenburg, Phys. Rev. 98, 1308 (1955); 99, 617A (1955).

Level $Pd^{(106)}(p,p'\gamma)$ E_p = 2.9; γ scin
0.520 *7* $\tau = 10^{\mu\mu s}$ (α = 0.006)
J = 2+ $p,\gamma(\theta)$

P.H.Stelson, F.K.McGowan, Phys. Rev. 99, 112, 127 (1955).

Pd^{106}
46 60
stable

Level $Pd^{106}(p,p'\gamma)$ E_p = 2.8; γ scin
0.500 $\tau = 50^{\mu\mu s}$ (α = 0.006)

H.Mark, C.McClelland, C.Goodman, Phys. Rev. 98, 1245 (1955); 99, 617A (1955).

Pd^{108}
46 62
stable

Level $Pd^{108}(\alpha,\alpha'\gamma)$ E_α = 6.0; γ scin
0.424 *6* $\tau = 27^{\mu\mu s}$ (α = 0.009)

G.M.Temmer, N.P.Heydenburg, Phys. Rev. 98, 1308 (1955); 99, 617A (1955).

Level $Pd^{(108)}(p,p'\gamma)$ E_p = 2.5; γ scin
0.445 *5* $\tau = 15^{\mu\mu s}$ (α = 0.009)
J = 2+ $p,\gamma(\theta)$

P.H.Stelson, F.K.McGowan, Phys. Rev. 99, 112, 127 (1955).

Level $Pd^{108}(p,p'\gamma)$ E_p = 2.8; γ scin
0.425 $\tau = 100^{\mu\mu s}$ (α = 0.009)

H.Mark, C.McClelland, C.Goodman, Phys. Rev. 98, 1245 (1955); 99, 617A (1955).

Pd^{110}
46 64
stable

Level $Pd^{110}(p,p'\gamma)$ E_p = 2.8; γ scin
0.365 $\tau = 170^{\mu\mu s}$

H.Mark, C.McClelland, C.Goodman, Phys. Rev. 98, 1245 (1955); 99, 617A (1955)

Level $Pd^{(110)}(p,p'\gamma)$ E_p = 2.9; γ scin
0.380 *5* $\tau = 36^{\mu\mu s}$ (α = 0.014)
J = 2+ $p,\gamma(\theta)$

P.H.Stelson, F.K.McGowan, Phys. Rev. 99, 112 (1955).

Level $Pd^{110}(\alpha,\alpha'\gamma)$ E_α = 6.0; γ scin
0.370 *5* $\tau = 44^{\mu\mu s}$ (α = 0.014)

G.M.Temmer, N.P.Heydenburg, Phys. Rev. 98, 1308 (1955); 99, 617A (1955).

Pd^{112}
46 66
21^h

		U(28-Mev d, f)	chem
β^-	0.28 *2*		a $\beta\gamma$
γ	0.0185 *5**		scin
$(0.28\,\beta)(0.018\,\gamma)$			GM, scin
*Not identical with Ag K x ray			crit a

R.H.Nussbaum, A.H.Wapstra, M.J.Sterk, R.E.W. Kropveld, Physica 21, 77 (1955).

Ag
47

Levels Ag(p,p'γ) E_p = 2.5
~0.32 levels* J = 3/2− $p,\gamma(\theta)$
γ 0.325 *5* $\epsilon B(E2)$ = 0.22 scin
E2/M1 = 0.036 or 1.3 $p,\gamma(\theta)$
~0.42 levels* J = 5/2− $p,\gamma(\theta)$
4.5+ 0.104 *3* scin
100+ 0.427 *5* $\epsilon B(E2)$ = 0.36
*Averages for Ag^{107} and Ag^{109} levels

P.H.Stelson, F.K.McGowan, Phys. Rev. 99, 112, 127 (1955).

Ag_{47} Levels $Ag(p,p'\gamma)$ $E_p = 2.8$; γ scin
0.315 $\epsilon B(E2) = 0.079$
0.418 $= 0.086$

H.Mark, C.McClelland, C.Goodman, Phys. Rev. 98, 1245 (1955); 98, 249A (1955).

$Ag(n,n'\gamma)$ $E_n \sim 2.7$ scin

γ	0.332	1.99
	0.696	2.13
	0.795	2.32
	1.10	2.54

L.A.Rayburn, D.L.Lafferty, T.M.Hahn, Phys. Rev. 98, 701 (1955).

$Ag^{108}_{47\ 61}$ 2.3^m Resonance $Ag^{(107)}(n)$ $E_n = 9$ to 20 ev
(16.60 ev) $\sigma_o = 7300$ chopper
$J = 0$ $\Gamma = 0.11\ 1$ $\Gamma_n/\Gamma = 0.35\ 5$

C.Sheer, J.Moore, Phys. Rev. 98, 565 (1955).

$Ag^{110}_{47\ 63}$ 270^d γ 0.657 $\alpha_K \sim 2\times 10^{-3}$ sl ce,pe E2,M1

R.C.Rohr, R.D.Birkhoff, Phys. Rev. 98, 1266 (1955).

$Ag^{110}_{47\ 63}$ 24^s Resonance $Ag^{(109)}(n)$ $E_n = 1.8$ to 7 ev
(5.19 ev) $\sigma_o = 22,200$ chopper
$J = 1$ $\Gamma = 0.13\ 2$ $\Gamma_n/\Gamma = 0.121\ 7$

C.Sheer, J.Moore, Phys. Rev. 98, 565 (1951).

$Ag^{112}_{47\ 65}$ 3.2^h 21^hPd source chem scin

γ	100+	0.618 5	6+	1.83 6
	8+	1.10 5	9+	2.11 4
	20+	1.39 4	4+	2.51 6
	9+	1.62 6	2+	2.79 8

R.H.Nussbaum, A.H.Wapstra, M.J.Sterk, R.E.W.Kropveld, Physica 21, 77 (1955).

$Cd^{110}_{48\ 62}$ stable Level $Cd^{110}(\alpha,\alpha'\gamma)$ $E_\alpha = 6.0$; γ scin
0.654 9 $\tau = 3.6^{\mu\mu s}$ $(\alpha = 0.003)$

G.M.Temmer, N.P.Heydenburg, Phys. Rev. 98, 1308 1308(1955); 99, 617A (1955).

$Cd^{111}_{48\ 63}$ stable Level $Cd^{111}(\alpha,\alpha'\gamma)$ $E_\alpha = 6.0$; γ scin
0.340 6 $\epsilon B(E2) = 0.16$

G.M.Temmer, N.P.Heydenburg, Phys. Rev. 98, 1308 (1955); 99, 617A (1955).

Level $Cd^{111}(p,p'\gamma)$ $E_p = 2.8$; γ scin
0.330 $\epsilon B(E2) = 0.027$

H.Mark, C.McClelland, C.Goodman, Phys. Rev. 98, 1245 (1955); 99, 617A (1955).

$Cd^{111}_{48\ 63}$ 48.7^m Cd^{110}(pile n)
$(0.150\ \gamma)(0.247\ \gamma)(\theta)$ $\eta(\pi) = 0.07$ scin
$\eta(\pi)$ studied as function of delay between two γ's shows effect of quadrupole interaction

P.Lehmann, J.Miller, Compt. rend. 240, 298 (1955).

$Cd^{112}_{48\ 64}$ stable Level $Cd^{112}(\alpha,\alpha'\gamma)$ $E_\alpha = 6.0$; γ scin
0.620 9 $\tau = 4.5^{\mu\mu s}$ $(\alpha = 0.003)$

G.M.Temmer, N.P.Heydenburg, Phys. Rev. 98, 1308 (1955); 99, 617A (1955).

Level $Cd^{112}(p,p'\gamma)$ $E_p = 2.8$, γ scin
0.610 $\tau = 28^{\mu\mu s}$ $(\alpha = 0.003)$

H.Mark, C.McClelland, C.Goodman, Phys. Rev. 98, 1245 (1955); 99, 617A (1955).

$Cd^{113}_{48\ 65}$ stable Levels $Cd^{113}(\alpha,\alpha'\gamma)$ $E_\alpha = 6.0$; γ scin
0.290 5 $\epsilon B(E2) = 0.080$
0.550? < 0.14

G.M.Temmer, N.P.Heydenburg, Phys. Rev. 98, 1308 (1955); 99, 617A (1955).

Level $Cd^{113}(p,p'\gamma)$ $E_p = 2.8$; γ scin
0.290 $\epsilon B(E2) = 0.058$

H.Mark, C.McClelland, C.Goodman, Phys. Rev. 98, 1245 (1955); 98, 249A(1955); 99, 617A (1955).

$Cd^{114}_{48\ 66}$ stable Level $Cd^{114}(\alpha,\alpha'\gamma)$ $E_\alpha = 6.0$; γ scin
0.550 8 $\tau = 8^{\mu\mu s}$ $(\alpha = 0.0045)$

G.M.Temmer, N.P.Heydenburg, Phys. Rev. 98, 1308 (1955); 99, 617A (1955).

Level $Cd^{114}(p,p'\gamma)$ $E_p = 2.8$; γ scin
0.545 $\tau = 41^{\mu\mu s}$ $(\alpha = 0.0045)$

H.Mark, C.McClelland, C.Goodman, Phys. Rev. 98, 1245 (1955); 98, 249A (1955); 99, 617A (1955).

$Cd^{116}_{48\ 68}$ stable Level $Cd^{116}(\alpha,\alpha'\gamma)$ $E_\alpha = 6.0$; γ scin
0.508 8 $\tau = 11^{\mu\mu s}$ $(\alpha = 0.0055)$

G.M.Temmer, N.P.Heydenburg, Phys. Rev. 98, 1308 (1955); 99, 617A (1955).

$In^{115}_{49\ 66}$ $6\times 10^{14}y$ Level $In^{(115)}(p,p'\gamma)$ $E_p = 3.0$; γ scin
0.500 $\epsilon B(E2) = 0.058$

H.Mark, C.McClelland, C.Goodman, Phys. Rev. 98, 1245 (1955).

In^{116} 49 67 13^{s}

Resonances In^{115}(n) cryst

E_o (ev)	σ_o	Γ_γ (ev)	Γ (ev)
1.456	38,500	0.072 ± 2	0.075
3.85	1,270	0.081 ± 4	0.081

H.H.Landon, V.L.Sailor, Phys. Rev. 98, 225A, 1267 (1955).

Sn 50

Sn(p,p'γ) $E_p \leq 2.75$

No γ with $E_\gamma < 0.6$ scin

H.Mark, C.McClelland, C.Goodman, Phys. Rev. 98, 1245 (1955).

Sb 51

Sb(p,p'γ) $E_p \leq 2.75$

No γ with $E_\gamma < 0.6$ scin

H.Mark, C.McClelland, C.Goodman, Phys. Rev. 98, 1245 (1955).

Sb^{122} 51 71 2.75^{d}

γ 0.570 $\alpha_K = 7\times10^{-3}$ sl ce,pe

K/LM = 2.3 ± 0.4 E2, M1

R.C.Rohr, R.D.Birkhoff, Phys. Rev. 98, 1266 (1955).

Sb^{122} 51 71 3.5^{m}

Sb^{121}(pile n,γ)

γ 0.0607 scin, sπ ce

0.0753 E3, M3 from τ of 3.5^{m}

(0.0607 + 0.0753 γ) x scin

J.M.LeBlanc, J.M.Cork, S.B.Burson, Phys. Rev. 98, 39 (1955).

Te 52

Te(p,p'γ) $E_p \leq 2.75$

No γ with $E_\gamma < 0.6$ scin

H.Mark, C.McClelland, C.Goodman, Phys. Rev. 98, 1245 (1955).

I^{126} 53 73 13.3^{d}

Te^{126}(14-Mev d,2n), I^{127}(fast n,2n) chem

β^-	5.6%	0.385	5		sl $\beta\gamma$
	29%	0.865	5		sl $\beta\gamma$
	9.3%	1.250	10	$\Delta J = 2$, yes shape	sl
β^+	0.28%	0.460	15		
	0.96%	1.110	20	$\Delta J = 2$, yes shape	sl
γ	34%	0.386	2	α_K=0.017	sl ce
	5.0%	0.48	1		scin
	33%	0.65	1		
	3.6%	0.75	2		
	0.8%	0.86	2		
	<0.5%	(1.42)			

$\epsilon_K/0.65\gamma$ = 1.46 (Te K x ray/0.65γ) scin,pc

(0.386γ)(0.48γ) (0.65γ)(0.75γ) scin

(0.65γ, 0.75γ)x (0.65γ)$\gamma^{\pm}$

L.Koerts, P.Macklin, B.Farrelly, R.van Lieshout, C.S.Wu, Phys. Rev. 98, 1230, 1172A (1955).

I^{127} 53 74 stable

Level I^{127}(p,p'γ) E_p= 2.0; γ scin

0.212

H.Mark, C.McClelland, C.Goodman, Phys. Rev. 98, 1245 (1955).

Xe^{135} 54 81 9.2^{h}

β^-	~3%	0.550	U(n,f) ms; sl $\beta\gamma$
	97%	(0.910)	
γ	100+	0.250	scin
	~0.1+	0.36	
	3+	0.604 6	

(0.550 β)(0.60 γ) (ce$_K$ 0.250 γ)(0.36 γ) sl

No (ce$_K$ 0.250 γ)(0.60 γ)

S.Thulin, Arkiv Fysik 9, 137 (1955); Phys. Rev. 94, 734 (1954).

Xe^{138} 54 84 17^{m}

U(n,f) ms but 33^{m}Cs d present

γ	100+	0.42 2	1.78 3	scin
	20+	0.51 2	2.01 3	

S.Thulin, Arkiv Fysik 9, 137 (1955).

Cs^{128} 55 73 3.8^{m}

β^+	3+	1.5	d 2.4^{d}Ba sl
	30+	2.5	
	70+	3.0	

β^+/ϵ = 3.1

γ 0.445 α = 0.016 scin,sl ce

0.980

J.M.Hollander, M.I.Kalkstein, Phys. Rev. 98, 260A (1955).

Cs^{129} 55 74 31^{h}

Cs^{133}(80-Mev p,p 4n) chem

γ 0.365 6 scin

0.55 3

B.L.Robinson, R.W.Fink, Phys. Rev. 98, 231A (1955); verbal report.

Cs^{132} 55 77 6.2^{d}

Cs^{133}(80-Mev p,pn) chem

τ 6.2^{d} 2

γ	1000+	0.669 3	scin
	7+	1.10 4	
	8+	1.26 2	

(0.669γ)(E_γ>0.7) No (0.669γ)(1.26γ)

No ϵ to g.s. (<20%) xγ/γ

B.L.Robinson, R.W.Fink, Phys. Rev. 98, 231A (1955).

Cs^{133} 55 78 stable

μ +2.56421 I

$\nu(Cs^{133})/\nu(H^2)$ = 0.854496 18

H.E.Walchli, ORNL-1775 (1954).

Cs^{134} 55 79 2.3^y

β^-	0.335	sl $\beta\gamma$
	0.64	
	~0.67	
γ	0.60	scin
	0.80	
	1.35	

$(0.335\beta,\ 0.64\beta)(E_\gamma>1.10)$ sl, scin

$(\sim 0.67\beta)(E_\gamma>0.95)$ $(0.64\beta)(E_\gamma>0.36)$

G.Bertolini, M.Bettoni, E.Lazzarini, Nuovo Cim. 1, 746 (1955).

Cs^{138} 55 83 33^m

$17^m Xe^{138}$ source scin

γ	20+	0.128 *6*		
	20+	0.460 *5*	100+	1.44 *2*
	3+	0.55 *1*	20+	2.24 *3*
	25+	0.98 *2*	10+	2.68 *3*

S.Thulin, Arkiv Fysik 9, 137 (1955).

Ba^{128} 56 72 2.4^d

ϵ Cs^{133}(106-Mev p, 6n) chem

γ ~20% 0.270 α=0.35 scin, sl ce

K/L~2.5

J.M.Hollander, M.I.Kalkstein, Phys. Rev. 98, 260A (1955).

Ba^{133} 56 77 10^y

γ		0.072 *2* α_K=2.4 x/γ	scin $\gamma\gamma$
		0.082	
	26+	0.290	
	74+	0.362	

$(0.29\gamma)(0.072\gamma,\ 0.082\gamma)$ $(0.36\gamma)(0.082\gamma)$

K x rays are due to conversion only and $\epsilon_L/\epsilon_K \geq 9$ assuming α_K = 1.6 for 0.082 γ

M.Langevin, Compt. rend. 240, 289 (1955).

$(0.36\gamma)(0.082\gamma)$ delay = $6.0\pm0.4\times10^{-9s}$ scin

P.Lehmann, J. Miller, Compt. rend. 240, 1525 (1955).

Ba^{140} 56 84 13^d

γ 0.541 $\alpha_K = 6\times10^{-3}$ sl ce, pe

K/LM = 5.2 ± 0.5 E2

R.C.Rohr, R.D.Birkhoff, Phys. Rev. 98, 1266 (1955).

La^{139} 57 82 stable

Q +0.6 *2* S

K.Murakawa, Phys. Rev. 98, 1285 (1955)

Q ~0.3 *1* S

G.Lührs, A.Steudel, Naturwiss. 42, 120(1955).

La^{140} 57 83 40.2^h

γ 0.489 $\alpha_K\sim5\times10^{-3}$ sl ce, pe

K/LM = 4.2 ± 1.4 E1, E2

R.C.Rohr, R.D.Birkhoff, Phys. Rev. 98, 1266 (1955).

$(0.815\gamma)(1.60\gamma)(\theta)$ J = 3, 1, 0 or 3, 2, 0

$(0.485\gamma)(1.60\gamma)(\theta)$ J = 4, 2, 0 scin

$(0.328+0.485+0.815\gamma)(1.60\gamma)(\theta)$ consistent with $3^-, 4^+, 2^+, 0^+$ or with $3^+, 4^-, 2^-, 0^+$ for levels at 2.42, 2.09, 1.60 and 0 Mev

G.R.Bishop, J.P.Perez y Jorba, Phys. Rev. 98, 89 (1955).

Pr^{142} 59 83 19.2^h

β^-	2.8%	0.70 *15*	a $\beta\gamma$
	97.2%	2.12 *10*	a
γ	100+	1.61 *2*	scin

No 0.134 γ (<4+) No 0.329 γ (<7+)

No 0.624 γ (<7+) No γ with E_γ > 1.61

M.J.Sterk, R.H.Nussbaum, H.Cerfontain, Physica 21, 541 (1955).

Pm^{147} 61 86 2.6^y

τ 2.52^y *8* ms

From 147/149 abundance ratios in fission products differing in age by 5.6^y

E.A.Melaika, M.J.Parker, J.A.Petruska, R.H. Tomlinson, Can. J. Chem. 33, 830 (1955).

Sm^{151} 62 89 ~93^y

τ ~93^y ms

From 151/149 abundance ratios in fission products differing in age by 6.4^y

E.A.Melaika, M.J.Parker, J.A.Petruska, R.H. Tomlinson, Can. J. Chem. 33, 830 (1955).

Eu^{152} 63 89 13^y

$\gamma(0.122\gamma)$ delay = 1.4×10^{-9s}

A.W.Sunyar, Phys. Rev. 98, 653 (1955).

Resonances $Eu^{(151)}$(n) cryst

E_0 (ev)	σ_0	Γ_γ (ev)	Γ(ev)
0.327	1,840	0.070±10	0.070
0.461	11,500	0.093±3	0.093
1.056	1,640	0.094±3	0.094

H.H.Landon, V.L.Sailor, Phys. Rev. 98, 225A, 1267 (1955).

Eu^{154} 63 91 16^y

$\gamma(0.123\gamma)$ delay = 1.2×10^{-9s}

A.W.Sunyar, Phys. Rev. 98, 653 (1955).

Ho^{167} 67 100 3.0^h

τ		3.0^h	$Er^{(170)}$ (15-Mev p,α)	chem
			$Er^{(167)}$ (fast n,p)	chem
β^-	~50%	0.28		a
	~50%	0.96		a, scin
γ	~18%	0.35		scin
	~ 6%	0.70		scin
No strong x ray				scin

T.Handley, W.S.Lyon, E.L.Olson, Phys. Rev. 98, 638 (1955).

Yb^{173} 70 103 stable

J 5/2 S

K.Krebs, H.Nelkowski, Ann. Physik 15, 124 (1955).

Yb^{175} 70 105 4.2^d

β^-	10%	0.072 *3*		sd
	3%	(0.350)		
	87%	0.463 *3*		
γ	25+	0.1130 *3*	K/LM~2.5	scin; sd ce
			α_K = 2.2 E2/M1 = 0.3	
	50+	0.281 *1*	K/L > 4 M2/E1~0.04*	
	100+	0.3951 *3*	K/L~5.9 M2/E1=0.26*	
			L/MN~4.3	

*(ce$_K$ 0.281 γ)/(ce$_K$ 0.395 γ) = 0.30
(0.072 β)(0.281 γ, 0.395 γ) delay < 6×10^{-8}s
(0.350 β)(0.113 γ) delay < 2×10^{-9}s

H. de Waard, Phil. Mag. 46, 445 (1955).

(0.281 γ)(0.113 γ)(θ) J = 9/2, 9/2, 7/2
with quadrupole/dipole = 0.02* for 0.281 γ
or J = 7/2, 9/2, 7/2
with quadrupole/dipole = 0.14* for 0.281 γ
*Using E2/M1 = 0.3 for 0.113 γ (See deWaard above)

L.Åkerlind, B.Hartmann, T.Wiedling, Phil. Mag. 46, 448 (1955).

γ		0.113	Pu^{239}(n,f) chem; scin
	W	0.143	
		0.283	
		~0.40	

(0.283 γ)(0.113 γ, K x ray)
(0.113 γ)(K x ray)

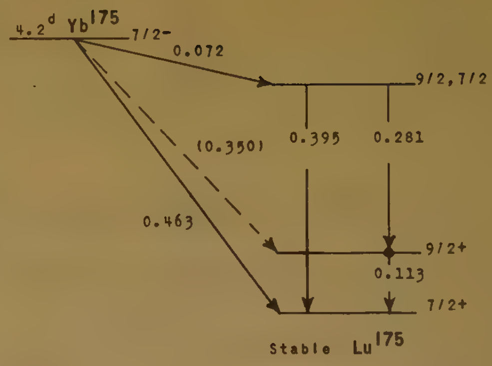
J.R.Grover, UCRL-2841 (1954).

γ		0.113 *1*	α_K = 2.4 γx/$\gamma\gamma$; scin
	58+	0.282	
	100+	0.396	

(0.282 γ)(0.113 γ, K x ray)
No (0.396 γ)γ

(CONTINUED)

Yb^{175} 70 105 4.2^d



N.Marty, Compt. rend. 240, 963 (1955).

Yb^{177} 70 107 1.8^h

β^-	9%	(1.15)		sl
	3%	(1.18)		
	88%	1.30 *5*		
γ	18+	0.119 *1*	K/LM~3	scin, sl ce
	100+	0.146 *1*	K/LM~3.5	
			α_K = 0.63 M2/E1=0.11	

β(0.146 γ) delay = 0.122 μs

H. de Waard, Phil. Mag. 46, 445 (1955).

Lu^{175} 71 104 stable

Levels		$Lu^{(175)}$(p,p'γ)	E_p = 2.6
γ	0.112 *3*		scin
	0.240 *7*		

C.McClelland, H.Mark, C.Goodman, Phys. Rev. 97, 1191 (1955); 98, 249A (1955).

Hf 72

Levels		Hf(p,p'γ)	E_p = 4.0; γ scin
	~0.090	τ = 100 $\mu\mu$s*	(α = 6.1)

*Average half-life for 0.087, 0.091, and 0.092 levels of Hf^{176}, Hf^{178}, and Hf^{180} resp.

P.H.Stelson, F.K.McGowan, Phys. Rev. 99, 112 (1955).

Hf^{176} 72 104 stable

Level		Hf^{176}(p,p'γ) E_p = 1.5	
γ	0.087 *3*		scin

C.McClelland, H.Mark, C.Goodman, Phys. Rev. 97, 1191 (1955); 98, 249A (1955).

Hf^{177} 72 105 stable

Levels		Hf^{177}(p,p'γ) E_p = 2.6	
γ	0.112 *3*		scin
	0.235 *7*		

C.McClelland, H.Mark, C.Goodman, Phys. Rev. 97, 1191 (1955); 98, 249A (1955).

Hf^{178} 72 106 stable

Level $Hf^{178}(p,p'\gamma)$ $E_p = 1.5$

γ 0.091 3 scin

C.McClelland, H.Mark, C.Goodman, Phys. Rev. 97, 1191 (1955); 98, 249A (1955).

Hf^{179} 72 107 stable

Levels $Hf^{179}(p,p'\gamma)$ $E_p = 2.6$

γ 0.122 4 scin

0.250 15

C.McClelland, H.Mark, C.Goodman, Phys. Rev. 97, 1191 (1955); 98, 249A (1955).

Hf^{180} 72 108 stable

Level $Hf^{180}(p,p'\gamma)$ $E_p = 1.5$

γ 0.092 3 scin

C.McClelland, H.Mark, C.Goodman, Phys. Rev. 97, 1191 (1955); 98, 249A (1955).

Hf^{181} 72 109 46^d

		E2	M1	
γ	(0.132)	100%		$\gamma\gamma(\theta)$
	(0.135)	20%	80%	
	(0.345)	100%		
	(0.480)	97%	3%	

$(0.132\gamma)(0.480\gamma)(\theta)$ J = 1/2, 5/2, 7/2

$(0.345\gamma)(0.135\gamma)(\theta)$ J = 5/2, 9/2, 7/2

H.Paul, Purdue University, Dissertation Abstr. 15, 855 (1955).

$(0.132\gamma)(0.480\gamma)$ delay = 1.0×10^{-8s} scin

L.Dick, R.Foucher, N.Perrin, H.Vartapetian, Compt. rend. 240, 1335 (1955).

Ta^{180} 73 107 8.15^h

(K x ray)(0.093γ) delay = 1.4×10^{-9s}

A.W.Sunyar, Phys. Rev. 98, 653 (1955); 95, 626A (1954).

Ta^{181} 73 108 stable

Levels $Ta^{181}(p,p'\gamma)$ $E_p = 1.4$ to 5.0

0.137 level

γ (0.137) $\epsilon B(E2) = 2.5$ scin

0.303 level

γ (0.166) E2/M1 = 0.25 $p,\gamma(\theta)$

(0.303) $\epsilon B(E2) = 0.62$ scin

P.H.Stelson, F.K.McGowan, Phys. Rev. 99, 112 (1955).

Levels $Ta^{181}(p,p'\gamma)$

γ 0.138 4 scin

0.300 9

C.McClelland, H.Mark, C.Goodman, Phys. Rev. 97, 1191 (1955); 98, 249A (1955).

Ta^{181} 73 108 stable

Level $Ta^{181}(\gamma,\gamma')$

(0.61) $\tau = 20.5^{\mu s}$ 4

T.F.Godlove, J.G.Carver, Phys. Rev. 99, 1634A (1955).

Ta^{182} 73 109 111^d

$\gamma(0.100\gamma)$ delay = 1.3×10^{-9s}

A.W.Sunyar, Phys. Rev. 98, 653 (1955); 95, 626A (1954).

Resonance $Ta^{181}(n)$

4.30 ev $\sigma_o\Gamma^2 = 49$ 7

T.F.Godlove, J.G.Carver, Phys. Rev. 99, 1634A (1955).

Ta^{183} 73 110 5^d

τ		5.0^d 1	W($\leq$50-Mev n)	chem
β^-	~30%	~0.15		a
	~70%	0.6		scin
γ	100+	0.060 + K x ray		
	20+	0.110		
	20+	0.160		
	12+	0.210		
	40+	0.240		
	70+	0.320		

A.J.Poë, Phil. Mag. 46, 611 (1955).

Ta^{184} 73 111 8.7^h

τ		8.7^h 1	W^{184}(fast n,p)		chem
β^-	~30%	~0.15			a
	~70%	1.26 7			scin
γ	40+	K x ray	35+	0.300	scin
	30+	0.110	100+	0.405	
	10+	0.160	17+	0.780	
	10+	0.210	90+	0.890	
	60+	0.240	50+	1.180	

F.D.S.Butement, A.J.Poë, Phil. Mag. 46, 482 (1955).

Ta^{185} 73 112 49^m

			W^{186}($\leq$50-Mev n,pn)	chem
τ		49.5^m 15		
β^-	~30%	~0.15		a
	~70%	1.72		scin
γ	100+	0.060 + K x ray		
	28+	0.125		
	71+	0.175		
	18+	0.235		

A.J.Poë, Phil. Mag. 46, 611 (1955).

W 74

Levels W$(p,p'\gamma)$ $E_p = 4.0$; γ scin

~0.112 $\tau = 780^{\mu\mu s *}$

*Average half-life for the 0.100, 0.112, and 0.124 levels of W^{182}, W^{184}, and W^{186} resp.

P.H.Stelson, F.K.McGowan, Phys. Rev. 99, 112 (1955).

W^{179}
74 105

Ta^{181}(32-Mev p, 3n)
No activity with $2^m < \tau < 25^m$

S.D.Softky, Phys. Rev. 98, 736, 280A (1955).

W^{180}
74 106
0.006^s

Ta^{181}(13-Mev p, 2n)
τ 0.0055^s *3* not by W(32-Mev p)
γ 0.22 ? scin
$\sim$0.35

S.D.Softky, Phys. Rev. 98, 736, 280A (1955).

W^{181}
74 107
140^d

No β^+, no ce sl
No $\sim 0.15\gamma$ ($< 10^{-3}$% of K x ray) scin
(L x ray)/(K x ray) = 0.39 *1* pc
from which ϵ_L/ϵ_K = 1.54
and E_{dis} = 0.92 *9*

A.Bisi, S.Terrani, L.Zappa, Nuovo Cim. 1, 651 (1955).

W^{183}
74 109
5.5^s

τ $\sim 5.5^s$ W(fast n)
γ 100+ 0.060 + K x ray scin
25+ 0.105
10+ 0.155

A.J.Poë, Phil. Mag. 46, 611 (1955).

W^{183}
74 109
stable

μ +0.115 *1** Metallic W I
$\nu(W^{183})/\nu(H^2)$ = 0.27395 *3*
*Corrected for Knight shift for metal

P.B.Sogo, C.D.Jeffries, Phys. Rev. 98, 1316, 265A (1955).

Level $W^{(183)}$(p, p'γ) E_p = 4.0; γ scin
0.295 *5* $\epsilon B(E2)$ = 0.27

P.H.Stelson, F.K.McGowan, Phys. Rev. 99, 112 (1955).

W^{185}
74 111
1.6^m

τ 1.62^m *5* W^{184}(n, γ)
γ 100+ 0.060 + K x ray ?
50+ 0.130
50+ 0.165
(0.165 γ)(0.130 γ, K x ray)
Not d 49^mTa ($<$ 0.6%) chem

A.J.Poë, Phil. Mag. 46, 611 (1955).

W^{185}
74 111
73^d

β^- 10+ (0.370) $W^{(184)}$(pile n, γ)
90+ 0.426 *3* sl
γ 2.4+ 0.0556 *1* $\alpha_L \sim 3$ M1 pc, scin
x $\sim$0.7+ L x ray
No 0.13 γ, 0.29 γ scin

A.Bisi, S.Terrani, L.Zappa, Nuovo Cim. 1, 291 (1955).

W^{185} ?
74 111
73^d

W(pile n, γ)
γ 17+ 0.060 + K x rays ? scin
100+ 0.134
β/(0.060 γ + 0.134 γ) = 0.11

A.M.Mijatovic, Bull. Inst. Nuclear Sci., Boris Kidrich 4, 75 (1954).

Re^{185}
75 110
stable

Levels Re^{185}(p, p'γ)
γ 0.130 *4* scin
0.290 *17*

C.McClelland, H.Mark, C.Goodman, Phys. Rev. 97, 1191 (1955); 98, 249A (1955).

Re^{186}
75 111
3.8^d

β^- 0.05% $\sim$0.3 sl $\beta\gamma$
24% 0.934* sl $\beta\gamma$, pc
76% 1.0715* *10* sl, pc
(E_β = 0.9)(0.137 γ)(θ) $\eta(\pi)$ = +0.13
*F-K plot non-linear, not ΔJ = 2, yes shape
Different ratio of matrix elements are needed to fit angular correlation and β spectrum shape

F.T.Porter, M.S.Freedman, T.B.Novey, F.Wagner, Jr., Phys. Rev. 98, 214 (1955); Phys. Rev. 99, 671A (1955); verbal report.

Re^{187}
75 112
?

Levels Re^{187}(p, p'γ)
γ 0.139 *4* scin
0.320 *19*

C.McClelland, H.Mark, C.Goodman, Phys. Rev. 97, 1191 (1955); 98, 249A (1955).

Re^{188}
75 113
16.9^h

β(0.155 γ) delay = 7×10^{-10} s

A.W.Sunyar, Phys. Rev. 98, 653 (1955); 95, 626A (1954).

Re^{190}
75 115
2.8^m

$Os^{(192)}$(21-Mev d, α) chem
$Os^{(190)}$(fast n, p)
τ 2.3^m *5*
β^- 1.7 *3* a
γ $\sim$10+ 0.191 scin
$\sim$10+ 0.392
$\sim$10+ 0.569
$\sim$3+ 0.830
$E_\gamma/\beta \sim$1.5 Mev a

A.H.W.Aten, Jr., G.D.deFeyfer, Physica 21, 543 (1955).

Os^{187}
76 111
stable

J 1/2 S
μ +0.12 *4*

K.Murakawa, Phys. Rev. 98, 1285 (1955).

Ir^{187} 77 110 12^h

τ		14^h *2*	d 2.5^hPt	chem
γ	100+	0.135 *10*		scin
	110+	0.300 *10*		
	80+	0.435 *15*		

W.G.Smith, J.M.Hollander, Phys. Rev. 98, 1258, 262A (1955).

Ir^{188} 77 111 41^h

$Ir^{(191)}$(32.Mev p,p3n) chem

τ		41^h *4*	d 10.3^dPt	chem
γ	90+	0.150 *10*		
	60+	0.475 *10*		
	100+	0.625 *15*		

W.G.Smith, J.M.Hollander, Phys. Rev. 98, 1258, 262A (1955).

Ir^{189} 77 112 11^d

$Ir^{(191)}$(25-Mev p, p2n) chem

τ	11^d *2*	d 10.5^hPt	chem
γ	~0.135 ?		scin
	0.245 *10*		

W.G.Smith, J.M.Hollander, Phys. Rev. 98, 1258, 262A (1955).

Ir^{194} 77 117 19^h

Ir^{193}(pile n,γ)

β^-		0.74			scin $\beta\gamma$
		0.94			scin $\beta\gamma$
		1.88			scin $\beta\gamma$
γ	(200+)	0.295		1.28 ?	scin
	1000+	0.325	18+	1.45	
	100+	0.635		1.58 ?	
		0.640	9+	1.77	
	76+	0.93	2+	2.00	
	85+	1.14			

(0.74β)(1.14γ) (1.88β)(0.325γ) scin
(0.94β)(0.93γ) scin
(0.325γ)(0.295γ, 0.93γ, 1.14γ, 1.45γ)
(~0.64γ)(0.295γ, 0.325γ, 0.93γ)
(0.64γ)(0.63γ)
(0.295γ)(0.325γ)(θ) J = 2, 2, 0
No (0.295γ)(0.93γ, 1.14γ)
No (0.325γ)(E_γ > 1.6)
1.14γ and 1.45γ in coincidence with 0.325γ only

C.E.Mandeville, J. Varma, B.Saraf, Phys. Rev. 98, 94, 1185A (1955).

Pt^{187} 78 109 2.5^h

τ	2.5^h *5*	Ir(120-Mev p)	chem
		not by Ir(32-Mev p)	chem
		p 12^hIr	chem

W.G.Smith, J.M.Hollander, Phys. Rev. 98, 1258, 262A (1955).

Pt^{188} 78 110 10.3^d

$Ir^{(191)}$(32-Mev p,4n) chem

τ		10.0^d *3*	p 41^hIr	chem
γ	100+	0.195 *10*		
	10+	0.275 *10*		
	30+	~0.40		

W.G.Smith, J.M.Hollander, Phys. Rev. 98, 1258, 262A (1955).

Pt^{189} 78 111 10.5^h

$Ir^{(191)}$(18-Mev p,3n) chem

τ	10.5^h *10*	d 42^mAu	p 11^dIr
γ	0.14 *1*	≥0.55 ?	scin
	~0.55 ?	~0.70 ?	

W.G.Smith, J.M.Hollander, Phys. Rev. 98, 1258, 262A (1955).

Pt^{191} 78 113 3.0^d

τ		3.0^d *3*	d 3^hAu	chem
γ	~50+	0.125 *10*		scin
	~40+	0.175 *10*		
	20+	0.265 *10*		
	100+	0.355 *10*		
	80+	0.405 *10*		
	20+	0.445 *20*		
	170+	0.530 *10*		

W.G.Smith, J.M.Hollander, Phys. Rev. 98, 1258, 262A (1955).

γ(0.082γ) delay = 3.8×10^{-9}s
γ(0.129γ) delay < 0.5×10^{-9}s

A.W.Sunyar, Phys. Rev. 98, 653 (1955).

Pt^{194} 78 116 stable

Level $Pt^{(194)}$(p,p'γ) E_p = 5.0; γ scin
0.330 *5* $\tau = 38^{\mu\mu s}$ (α = 0.074)

P.H.Stelson, F.K.McGowan, Phys. Rev. 99, 112 (1955).

Level Pt^{194}(p,p'γ) E_p = 3.0; γ scin
0.330 *10*

C.McClelland, H.Mark, C.Goodman, Phys. Rev. 97 1191 (1955); 94, 1437A (1954).

Level $Pt^{(194)}$(p,p'γ) E_p = 2.5 to 5.0
(0.330) γ scin
p,γ(θ) shows large deviation from theory
See Phys. Rev. 91, 1578 (1953)

P.H.Stelson, F.K.McGowan, Phys. Rev. 98, 249A (1955).

Pt^{195} 78 117 stable

γ $Pt^{(195)}$(p,p'γ) E_p = 5.0; γ scin

0.100 *3*	0.210 *3*
0.130 *3*	0.240 *3*

P.H.Stelson, F.K.McGowan, Phys. Rev. 99, 112 (1955).

Level Pt^{195}(p,p'γ) E_p = 3.0; γ scin
0.210 *6*

C.McClelland, H.Mark, C.Goodman, Phys. Rev. 97, 1191 (1955); Phys. Rev. 91, 760 (1953).

Pt^{196} 78 118 stable

Level $Pt^{(196)}(p,p'\gamma)$ $E_p = 5.0$; γ scin
0.358 *5* $\tau = 35^{\mu\mu s}$ ($\alpha = 0.060$)
$J = 2^+$ $p,\gamma(\theta)$

P.H.Stelson, F.K.McGowan, Phys. Rev. 99, 112, 127 (1955).

Level $Pt^{196}(p,p'\gamma)$ $E_p = 3.0$; γ scin
0.360 *11*

C.McClelland, H.Mark, C.Goodman, Phys. Rev. 97, 1191 (1955).

Level $Pt^{(196)}(p,p'\gamma)$ $E_p = 2.5$ to 5.0
(0.360) γ scin
$p,\gamma(\theta)$ shows large deviation from theory
See Phys. Rev. 91, 1578 (1953)

P.H.Stelson, F.K.McGowan, Phys. Rev. 98, 249A (1955).

Pt^{197} 78 119 18^h

$\beta(0.077\gamma)$ delay $= 1.9 \times 10^{-9s}$

A.W.Sunyar, Phys. Rev. 98, 653 (1955).

Pt^{198} 78 120 stable

Level $Pt^{(198)}(p,p'\gamma)$ $E_p = 5.0$; γ scin
0.403 *5* $\tau = 19^{\mu\mu s}$ ($\alpha = 0.042$)
$J = 2^+$ $p,\gamma(\theta)$

P.H.Stelson, F.K.McGowan, Phys. Rev. 99, 112, 127 (1955).

Level $Pt^{198}(p,p'\gamma)$ $E_p = 3.0$; γ scin
0.425 *13*

C.McClelland, H.Mark, C.Goodman, Phys. Rev. 97, 1191 (1955); 98, 249A (1955).

Au^{187} 79 108 $\sim 15^m$

τ $\sim 15^m$ Pt(130-Mev p) chem
p 2.5^hPt chem

W.G.Smith, J.M.Hollander, Phys. Rev. 98, 1258, 262A (1955).

Au^{188} 79 109 $\sim 10^m$

τ $\sim 10^m$ Pt (130-Mev p) chem
p 10.3^dPt chem

W.G.Smith, J.M.Hollander, Phys. Rev. 98, 1258, 262A (1955).

Au^{189} 79 110 42^m

τ 42^m *5* Pt(130-Mev p) chem
$Ta^{181}(C^{12},4n)$ chem
d$\sim 20^m$Hg p 10.5^hPt

γ	$\sim 10+$	0.135 *10*	scin
	100+	0.290 *10*	
		>0.80 ?	

W.G.Smith, J.M.Hollander, Phys. Rev. 98, 1258, 262A (1955).

Au^{191} 79 112 3^h

Pt(130-Mev p) chem

τ		3.0^h *5*	d 57^mHg	p 3.0^dPt	
γ	10+	0.14 *2*	4+	0.48 *2*	scin
	60+	0.30 *1*	10+	0.60 *2*	
	5+	0.39 *2*			
x	100+	K x ray			

No evidence for 18^h or 1^d Au^{191} from yield of 3.0^dPt

W.G.Smith, J.M.Hollander, Phys. Rev. 98, 1258, 262A (1955).

Au^{197} 79 118 stable

Levels $Au^{197}(p,p'\gamma)$ $E_p = 1.6$ to 5.0 scin

0.077 level
γ not observed $\epsilon B(E2) < 0.03$

0.268 level
γ 0.191 *3* $\epsilon B(E2) = 0.18$
No 0.077 γ

0.277 level $J = 5/2^+$ $p,\gamma(\theta)$
γ 0.277 *3* E2/M1$\sim$0.6 $p,\gamma(\theta)$
$\epsilon B(E2) = 0.25$

Level 0.550 level $J = 7/2^+$ $p,\gamma(\theta)$

γ	2.6+	(0.273)		$\gamma\gamma/\gamma$
	2.6+	(0.277)		$\gamma\gamma/\gamma$
	100+	0.550 *5*	$\epsilon B(E2) = 0.46$	scin
No 0.282 γ		(<0.5+)		$\gamma\gamma/\gamma$
No 0.473 γ		(<3+)		scin

P.H.Stelson, F.K.McGowan, Phys. Rev. 99, 112, 127 (1955).

γ $Au^{197}(n,n'\gamma)$ $E_n = 2.5$; γ scin
0.25 1.38
0.54 1.98
0.98
$(0.25\gamma)(0.98\gamma, 1.38\gamma, 1.98\gamma)$ Σ scin
No $(0.54\gamma)\gamma$

V.E.Scherrer, W.R.Faust, B.A.Allison, Phys. Rev. 98, 224A (1955).

Au^{198} 79 119 2.70^d

τ 2.686^d *5* differential ic

J.Tobailem, J. phys. radium 16, 48 (1955).

Resonance $Au^{197}(n)$ $E_n = 0.4$ to 15 ev
4.906 *10* ev cryst
$\Gamma = 0.140$ *3*
$\sigma_o = 37,000$ *500*
$\Gamma_\gamma = 0.124$ *3*

R.E.Wood, H.H.Landon, V.L.Sailor, Phys. Rev. 98, 639 (1955).

Hg^{189} 80 109 $\sim 20^m$

Au^{197}(120-Mev p,9n) chem
τ 20^m *10* p 42^mAu chem

W.G.Smith, J.M.Hollander, Phys. Rev. 98, 1258, 262A (1955).

Hg^{191} 80 111 57^m

τ	55^m *10*	p 3^hAu	chem
No $12^h Hg^{191}$		Au^{197}(120-Mev p,7n)	chem

W.G.Smith, J.M.Hollander, Phys. Rev. 98, 1258, 262A (1955).

Hg^{198} 80 118 stable

Level $\quad Hg^{(198)}(\gamma,\gamma)\quad Au^{198}$ at 1125°C

$\gamma \quad$ (0.411) J = 2 $\quad \gamma\gamma(\theta)$

$\tau = 2.3\times10^{-11}$s

F.R.Metzer, W.B.Todd, Phys. Rev. 95, 853 (1954); 97, 1258 (1955); 98, 1187A (1955).

Hg^{201} 80 121 stable

Q $\quad$ +0.45 *4* $\quad$ S

K.Murakawa, Phys. Rev. 98, 1285 (1955).

Hg^{202} 80 122 stable

Level $\quad Hg^{(202)}(\gamma,\gamma)\quad Tl^{202}$ at 1000°C

$\gamma \quad$ (0.439) J = 2 $\quad \gamma\gamma(\theta)$

$\tau = 2.4\times10^{-11}$s

F.R.Metzger, Phys. Rev. 98, 200 (1955).

Hg^{203} 80 123 47^d

β^-	100%	0.214 *2*	F-K linear	sd $\beta\gamma$, sd
	$<4\times10^{-3}$%	(0.493)		
γ		0.279	$\alpha_K = 0.21$	sd ce
			K : L : M = 14 : 4 : 1	
			30% M1 70% E2	

No ce between 0.01 and 0.16 (<0.7%)

N.Marty, Compt. rend. 240, 291 (1955).

Tl^{203} 81 122 stable

$\nu(Tl^{205})/\nu(Tl^{203}) = 1.009816$ *22* $\quad$ I

H.E.Walchli, ORNL-1775 (1955).

Levels $\quad Tl^{(203)}(p,p'\gamma)\quad E_p = 4.0$

$\quad Tl^{(203)}(\alpha,\alpha'\gamma)\quad E_\alpha = 4.0$

0.279 level

$\gamma \quad$ 0.279 *3* $\quad \epsilon B(E2) = 0.11 \quad$ scin

0.682 level

$\gamma \quad$ 0.279 *3* $\quad$ scin

0.410 *5*

$(0.279\gamma)(0.410\gamma)$

P.H.Stelson, F.K.McGowan, Phys. Rev. 99, 112, 616A (1955).

$\gamma \quad Tl^{(203)}(p,p'\gamma)\quad E_p = 3.0$ to 4.6

0.280 $\quad \epsilon B(E2) = 0.10 \quad$ scin

0.410 *6*

R.Barloutaud, T.Grjebine, M.Riou, Compt. rend. 240, 1207 (1955).

Tl^{204} 81 123

$Tl^{(203)}$(10-Mev d,p) chem

$\tau \quad 2.50^y$ *3*

No 4.0^y activity

Counted for 10 years

Identified with previously known $4^y Tl^{204}$

L.T.Cheng, V.C.Ridolfo, M.L.Pool, D.N.Kundu, Phys. Rev. 98, 231A (1955).

$\tau \quad 4.26^y$ *6* $\quad$ differential ic

$Tl^{(203)}$(pile n,γ) chem

J.Tobailem, J.Robert, J. phys. radium 16, 340 (1955).

$Tl^{(203)}$(pile n, γ)

β^-	96%	0.765 *10*	$\Delta J = 2$, yes shape*	sl
ϵ		Hg K x ray		scin
	4%		$e_{AK}/\beta = 0.003$	sl
			$e_{AL}/e_{AK} \sim 4$	sl

(0.0464 ce)/β=0.001 but no 0.060γ, 0.130γ

No 0.37γ (<0.01%) $\quad$ scin, sl

*Spectrum deviates from $\Delta J = 2$, yes shape below 0.4 Mev (excess of β's ~5%)

T.Yuasa, J.Laberrigue-Frolow, L.Feuvrais, J. phys. radium 16, 39, 165 (1955); Compt. rend. 238, 1500 (1954).

Tl^{205} 81 124 stable

Levels $\quad Tl^{(205)}(p,p'\gamma)\quad E_p = 4.0$

$\quad Tl^{(205)}(\alpha,\alpha'\gamma)\quad E_\alpha = 4.0$

0.205 level $\quad$ scin

$\gamma \quad$ 0.205 *3* $\quad \alpha = 0.9\pm0.5 \quad \gamma\gamma/\gamma$

$\epsilon B(E2) = 0.072$

0.615 level

$\gamma \quad$ 0.205 *3*

0.410 *5*

$(0.205\gamma)(0.410\gamma)$

P.H.Stelson, F.K.McGowan, Phys. Rev. 99, 112, 616A (1955).

$\gamma \quad Tl^{(205)}(p,p'\gamma)\quad E_p = 3.0$ to 4.6

0.205 *4* $\quad \epsilon B(E2) = 0.037 \quad$ scin

0.410 *6*

R.Barloutaud, T.Grjebine, M.Riou, Compt. rend. 240, 1207 (1955).

Tl^{209} 81 128 2.2^m

$\gamma \quad$ 0.12 $\quad$ scin

0.45

1.56

$(0.12\gamma)(0.45\gamma, 1.56\gamma)$

I.Perlman, F.Stephens, F.Asaro, Phys. Rev. 98, 262A (1955).

Pb_{82} Pb(n,n'γ) $E_n = 4.5$
γ 0.79 *2* scin
1.36?
2.70 *?*

G.L.Griffith, Phys. Rev. 98, 579 (1955).

$Pb^{204}_{82\ 122}$ 68^m (0.375γ)(0.898γ) delay $< 6\times10^{-10s}$

A.W.Sunyar, Phys. Rev. 98, 653 (1955).

$Pb^{206}_{82\ 124}$ stable Level Pb^{206}(p,p'γ) $E_p = 5.0$; γ scin
0.81 *1* $\tau = 7.7^{\mu\mu s}$ ($\alpha = 0.01$)

P.H.Stelson, F.K.McGowan, Phys. Rev. 99, 112, 616A (1955).

$Pb^{207}_{82\ 125}$ stable Level Pb^{207}(p,p'γ) $E_p = 4.5$; γ scin
0.57 *1* $\tau = 100^{\mu\mu s}$ ($\alpha = 0.021$)

P.H.Stelson, F.K.McGowan, Phys. Rev. 99, 112, 616A (1955).

$Pb^{(207)}$(n,n'γ) $E_n = 1.4$ to 3.2
Graph of σ for excitation of 0.82* level given from threshold (1.6) to 3.2 γ scin

*P.H.Stelson, E.C.Campbell, Phys. Rev. 97, 1222 (1955).

$Pb^{210}_{82\ 128}$ 19^y τ 19.40^y *35* differential ic

J.Tobailem, J. phys. radium 16, 235 (1955).

β^- ≥90% 0.017 *2* 4π scin
β(0.047γ) delay $<3\times10^{-9s}$

G.M.Lewis, Proc. Phys. Soc. 68A, 735 (1955).

$Pb^{212}_{82\ 130}$ 10.6^h τ 10.643^h *12* source addition

J.Tobailem, J.Robert, J. phys. radium 16, 115 (1955).

$Bi^{206}_{83\ 123}$ 6.4^d γ(0.803γ) delay $<5\times10^{-10s}$

A.W.Sunyar, Phys. Rev. 98, 653 (1955).

$Bi^{207}_{83\ 124}$ 8.0^y $Pb^{(206)}$(10-Mev d,n) chem
τ 8.0^y *6*
Counted for 11 years
Identified with previously known ~50^y Bi^{207} from study of γ spectrum

L.T.Cheng, V.C.Ridolfo, M.L.Pool, D.N.Kundu, Phys. Rev. 98, 231A (1955).

$Bi^{207}_{83\ 124}$ 8.0^y γ(0.570γ) delay $<4\times10^{-10s}$

A.W.Sunyar, Phys. Rev. 98, 653 (1955).

γ	100+	0.570	scin
	77+	1.07	
	9.2+	1.77*	

(0.57γ)(1.07γ, 1.77γ)
(1.77γ*)(0.57γ)(θ)
J = 7/2, 5/2, 1/2 *E2/M1 = 0.007
or J = 9/2, 5/2, 1/2 *M3/E2 = 0.034
(K x ray)(0.57γ)/(0.57γ) indicates ϵ_K to 0.57 level in 2.8% disintegrations
No (K x ray)(1.07γ, 1.77γ)
No 0.70γ (<0.5+) No 1.46γ (<0.2+)
No γ with $0.10 > E_\gamma > 0.50$

N.H.Lazar, E.D.Klema, Phys. Rev. 98, 710, 1186A (1955).

$Bi^{210}_{83\ 127}$ $2.6\times10^6{}^y$ Resonances Bi^{209}(n) $E_n = 1$ to 55 kev

E_0(kev)	l*	Γ(ev)*	E_0(kev)
<1			16
2.2	0	<<100	34
11.8*	0		47

C.T.Hibdon, A.Langsdorf, Jr., Phys. Rev. 98, 223A (1955); *verbal report.

$Bi^{214}_{83\ 131}$ 19.7^m

β^-	>5+	2.56 *25*	a βγ
	10+	(3.17)	

No (3.17β)γ

R.A.Ricci, G.Trivero, Nuovo Cim. 1, 717 (1955); Rend. Acad. nazl. Lincei 17, 44 (1954).

γ	322+	1.76	scin
	100+	2.20	
	48+	2.42*	

*2.48 ± 0.12 photons per 100 disintegrations by comparison with Ra standard

G.Backenstoss, K.Wohlleben, Z.Naturf. 10a, 384 (1955).

$At^{210}_{85\ 125}$ 8.3^h γ(0.047γ) delay $= 1.5\times10^{-9s}$

A.W.Sunyar, Phys. Rev. 98, 653 (1955); 95, 626A (1954).

$Ra^{223}_{88\ 135}$ 11.7^d

ce	<5*	<0.020	ppl
	10*	0.020-0.027	
	56*	0.027-0.092	
	29*	>0.092	

*Relative intensity of ce in indicated energy range

B.F.Bayman, M.A.S.Ross, Proc. Phys. Soc. 68A, 110 (1955).

Ra^{225} 88 137 14.8^d

β^-	0.32 *3*		d Th^{229}	chem
γ	0.0395 *20*	$\alpha_L \leq 1$ E1 $\tau < 2\times10^{-9s}$		γ/x

(0.32β)(0.0395γ)

I.Perlman, F.Stephens, F.Asaro, Phys. Rev. 98, 262A (1955).

Ra^{226} 88 138 1620^y

γ	(0.186)	K/LM=0.62 *5* α^*=0.22 *2*	ppl

*Using 5.7% for 4.611α

M.K.Jurić, D.M.Stanojević, Bull. Inst. Nuclear Sci., Boris Kidrich, 5, 15 (1955).

Ac^{227} 89 138 22^y

μ	+1.1	S
q	-1.7	

M.Fred, F.S.Tomkins, W.F.Meggers, Phys. Rev. 98, 1514 (1955).

τ 21.6^y *4* differential ic

J.Toballem, J. phys. radium 16, 48 (1955).

x 5%* L x ray scin

No 0.037γ (photon observed but assigned to K x ray of La carrier)

Complete conversion of ~0.016γ in 12% of disintegrations suggested

*From (L x ray)/(0.05γ of Fr^{223} and Th^{227} daughters) = 81

R.Bouchez, A.Michalowicz, M.Riou, J.Teillac, J. phys. radium 16, 344 (1955).

Th^{227} 90 137 18.2^d

		$L_1 : L_2 : L_3$		
γ	0.02995	— 3 : 10		s ce
	0.03162	3 : 10		
	0.05013	7 : 8 : 10	α_L<2 E1	
	0.06157	9 : 10		
	0.1004	10 : 8		
	0.1133	10 : 7		
	0.1731 ?	(ce_K only observed)		
	0.2050*			
	0.2346*			
	0.2361*			
	0.2564	1.6 : 10 : 4	K/L_2~1.2	
	0.2863*			
	0.3048*			
	0.3128*			
	0.3347*			

Maximum energy studied = 0.335

*$L_1 >> L_2, L_3$ K/L_1 = 7 to 9.

M.Frilley, S.Rosenblum, M.Valadares, G.Bouissières, J. phys. radium 16, 378 (1955); 15, 45 (1954).

Th^{230} 90 140 8.0×10^{4y}

α(0.068γ)(θ)	J = 0, 2, 0	ic, scin
α(0.148γ)(θ)	J = 0, 4, 2	
α(L x ray)(θ)	Isotropic	

No 0.142 level since α(0.14γ) shows just one α in coincidence with ~0.14γ

G.Valladas, J.Teillac, P.Falk-Vairant, P.Benoist, J. phys. radium 16, 125 (1955); Compt. rend. 238, 1409, 1656 (1954).

α(0.25γ)(θ) J = 0, 1, 0 ic, scin

P.Falk-Vairant, G.Y.Petit, Compt. rend. 240, 286 (1955).

Th^{232} 90 142 1.4×10^{10y}

γ	Th^{232}(p,p'γ)	E_p = 5.0
	0.053 *3*	scin
	0.760 *10* ?	

P.H.Stelson, F.K.McGowan, Phys. Rev. 99, 112 (1955).

Pa^{231} 91 140 $34,300^y$

α	0.3%	4.627	27%	(4.938)	s
	1.3%	4.667	28%	5.001	
	10%	4.724	23%	5.018	
	1.5%	4.843	8.7%	5.046	

J.P.Hummel, F.Asaro, I.Perlman, Phys. Rev. 98, 261A (1955).

U^{235} 92 143 7.1×10^{8y}

J 7/2 S

K.L.Vander Sluis, J.R.McNally, Jr., J. Opt. Soc. Amer. 45, 65 (1955).

U^{238} 92 146 4.51×10^{9y}

τ 4.507×10^{9y} *9*

From (1503 α's)/(min mg natural U) assuming relative abundances: 99.28, 0.715, 0.0058 α's: 1, 0.046, 1 for U^{238}, U^{235}, U^{234} resp.

A.F.Kovarik, N.I.Adams, Phys. Rev. 98, 46 (1955).

Np^{234} 93 141 4.4^d

		U^{235}(21-Mev d,3n)	chem
τ	4.4^d *1*		
β^+	~0.8		a, trochoid s

$\beta^+/\epsilon = 5\times10^{-4}$

R.J.Prestwood, H.L.Smith, C.I.Brown, D.C. Hoffman, Phys. Rev. 98, 1324 (1955).

Np^{239} 93 146 2.33^{d}

β^-	~20%	0.343 *15*	scin $\beta\gamma$ delay
γ	89%	0.105γ + K x ray	

(0.34β) γ delay = $0.193^{\mu s}$

No γ precedes $0.193^{\mu s}$ delay $\gamma\gamma$ delay

Decay scheme proposed

D. Engelkemeir, L.B. Magnusson, Phys. Rev. 99, 135 (1955).

Am^{241} 95 146 470^{y}

		L^*_{12}	L^*_{3}	M^*	N^*
γ	0.0265			~1.6	~0.7
	0.0326			3.2	1.6
	0.0428	5.0	3.1	4.5	~0.9
	0.0554	~0.4		~0.3	
	0.0592	22	3.5		10

(ce 0.043γ)(0.026γ) delay = 6×10^{-8s} sl ce

(ce 0.043γ)(0.059γ) delay = 6×10^{8s}

(ce 0.026γ)(0.033γ) delay $\leq 4\times10^{-9s}$

(ce 0.055γ)(ce 0.043γ, ce 0.059γ)

No ce 0.098γ (<0.5*)

No (ce 0.033γ)(ce 0.059γ)

*ce/100 α's

J.F. Turner, Phil. Mag. 46, 687 (1955).

Am^{243} 95 148 8800^{y}

α	1.1%	5.169	s
	11.5%	5.224	
	87.1%	5.267	
	0.16%	5.309	
	0.17%	5.340	

(5.267α)(0.075γ)(θ) J = 5/2, 3/2, 1/2

F. Stephens, J. Hummel, F. Asaro, I. Perlman, Phys. Rev. 98, 261A (1955).

Cf^{246} 98 148 1.5^{d}

α	22%	6.711	Cm(40-Mev α)chem;	s
	78%	6.753		
γ		~0.044	α = 1000	scin
	0.014+	0.103		scin

α(L x ray, 0.042γ, 0.103γ)

+Photons/100 α's

J.P. Hummel, F.S. Stephens, Jr., F. Asaro, A. Chetham-Strode, I. Perlman, Phys. Rev. 98, 22 (1955).

Fm^{254} 100 154 3.2^{h}

α	15%	(7.18)		α x/α
γ	0.02+	0.042 *4*	α = 750	scin
	0.028+	0.094 *2*		

α(L x ray, 0.042γ) d 37^{h}E

+Photons/100 α's

F. Asaro, F.S. Stephens, Jr., S.G. Thompson, I. Perlman, Phys. Rev. 98, 19, 260A (1955).

Fm^{256} 100 156 ~4^{h}

E^{255}(pile n,$\gamma\beta$) chem

τ for spontaneous fission 3 to 4 hours

G.R. Choppin, B.G. Harvey, S.G. Thompson, A. Ghiorso, Phys. Rev. 98, 1519 (1955).

Mv^{256} 101 155 ~0.5^{h}

τ ~0.5^{h} E^{253}(41-Mev α,n) chem

No α

A. Ghiorso, B.G. Harvey, G.R. Choppin, S.G. Thompson, G.T. Seaborg, Phys. Rev. 98, 1518 (1955).

TABLE 2 — NEUTRON CROSS SECTIONS

Absorption cross sections for neutron energies marked "th" (thermal) have been determined, from measurements in a thermal neutron flux, in terms of the cross section value of a "standard" for neutrons of velocity 2200 m/sec, or energy~0.025 ev. The standard used, when clearly stated by the experimenter, is given just after the reference and is generally one known to have a thermal absorption cross section with 1/v energy dependence. If the nucleus whose cross section is being measured also has a cross section with 1/v dependence, the cross section found for it by comparison with the standard will, of course, be a cross section for 2200 m/sec. If not, and the dependence often is not known, the value found by the comparison is $\overline{\sigma v}/2200$.

Target	Energy	σ	Value of σ or $\int d\sigma$	Method	Ref.
H	105	el (θ)	graph		55T17
	137	el (θ)	graph		55T17
H^2	0.2-22	t	table	n scin	55S61
	109-169	t	table		55A24
He	14.3	el (θ)	graph	cc	55S08
$Li^{(7)}$	0.5-1.7	$n,n'+0.48\gamma$	graph	γ scin	55F10
Be	4.0	t-el	0.62 *5*	sphere	55B08
	4.1	el (θ)	graph	n scin	55W27
	4.1	t	1.96	n scin	55W27
	4.1	t-$\int$el (θ)	0.6 *1*	n scin	55W27
Be^7	th	n,p	5.3×10^4 *8*	lc	55H34
	th	n,α	<1	lc	55H34
C	1.0	t-el	-0.09 *14*	sphere	55B08
	2.7	el (θ)	graph	n scin	55L31
	4.0	t-el	0.04 *8*	sphere	55B08
	4.1	el (θ)	graph	n scin	55W27
	4.1	t	1.88	n scin	55W27
	4.1	t-$\int$el (θ)	0.08 *10*	n scin	55W27
	4.4	el (90°)	0.06 *2*	ppl	55J08
	14	t-el	0.601 *6*	sphere	55G21
	14	k(t-el)*	0.08 *2*	sphere	55G21
C^{12}	14	$n,n'+4.4\gamma$	0.24	scin pr	55B58
N	0.80-1.54	el (θ)	graph		55F27
O	109-169	t	table		55A24
Na^{23}	14.1	n,2n	0.014 *2*	2.6^{y}Na	55P28
Mg	2.77	el + inel (θ)	graph		55O04
Al^{27}	1.0	t-el	0.04 *8*	sphere	55B08
	2.7	el (θ)	graph	n scin	55L31
	4.0	t-el	0.75 *5*	sphere	55B08
	4.1	el (θ)	graph	n scin	55W27
	4.1	t	2.3	n scin	55W27
	4.1	t-$\int$el (θ)	0.7 *2*	n scin	55W27
	14	t-el	1.00 *1*	sphere	55G21
	14	k(t-el)*	0.21 *1*	sphere	55G21
S	2.7	el (θ)	graph	n scin	55L31
A^{40}	14.8	n,α	$\sim3\times10^{-5}$	lc	55B78

Target	Energy	σ	Value of σ or $\int d\sigma$	Method	Ref.
Sc^{45}	0.0015 - 5000 ev	t	graph		55P08
Ti	4.0	t-el	1.28 *9*	sphere	55B08
	4.1	el (θ)	graph	n scin	55W27
	4.1	t	3.7	n scin	55W27
	4.1	t-$\int$el (θ)	1.2 *2*	n scin	55W27
Mn^{55}	0.0253ev	n,γ	13.2	2.58^h Mn	55D17
	0.98-1.3	$n,n'+0.85\gamma$	graph	γ scin	55F09
Fe	0.85-1.2	$n,n'+0.84\gamma$	graph	γ scin	55F09
	1.0	t-el	0.41 *4*	sphere	55B08
	4.0	t-el	1.42 *7*	sphere	55B08
	4.1	el (θ)	graph	n scin	55W27
	4.1	t	3.6	n scin	55W27
	4.1	t-$\int$el (θ)	1.5 *2*	n scin	55W27
	4.4	el (90°)	0.076 *20*	ppl	55J08
	4.4	n,3.4n' (90°)	0.036 *10*	ppl	55J08
	4.4	n,2.2n' (90°)	0.021 *7*	ppl	55J08
	4.4	n,1.6n' (90°)	0.012 *6*	ppl	55J08
	4.4	n,1.2n' (90°)	0.020 *13*	ppl	55J08
	14	t-el	1.27 *4*	sphere	55G21
	14	k(t-el)*	0.07 *3*	sphere	55G21
Ni	4.0	t-el	1.35 *9*	sphere	55B08
Cu	1.0	t-el	0.21 *5*	sphere	55B08
	4.0	t-el	1.60 *7*	sphere	55B08
	14	t-el	1.42 *5*	sphere	55G21
	14	k(t-el)*	0.24 *2*	sphere	55G21
	90	spallation for each of 18 products	table		55C23
Zn	1.0	t-el	0.10 *6*	sphere	55B08
	4.0	t-el	1.69 *6*	sphere	55B08
	4.1	el (θ)	graph	n scin	55W27
	4.1	t	3.7	n scin	55W27
	4.1	t-$\int$el (θ)	1.7 *2*	n scin	55W27
	14	t-el	1.46 *3*	sphere	55G21
	14	k(t-el)*	0.11 *4*	sphere	55G21
Zr	1.5	$n,n'+0.93\gamma$	~0.8	γ scin	55G33
	4.0	t-el	1.56 *7*	sphere	55B08
	4.1	el (θ)	graph	n scin	55W27
	4.1	t	4.1	n scin	55W27
	4.1	t-$\int$el (θ)	1.8 *2*	n scin	55W27
	4.4	el (90°)	0.096 *24*	ppl	55W11
	4.4	n,2.2n' (90°)	0.009 *4*	ppl	55W11
	4.4	n,1.6n' (90°)	0.008 *4*	ppl	55W11

Ag	1.0	t-el	1.61 *16*	sphere	55B08
	4.0	t-el	2.05 *10*	sphere	55B08
	13 to 18	t	graph		55B14
	14	t-el	1.82 *2*	sphere	55G21
	14	k(t-el)*	0.72 *3*	sphere	55G21
Cd	1.0	t-el	0.99 *6*	sphere	55B08
	4.0	t-el	2.05 *10*	sphere	55B08
	4.1	el(θ)	graph	n scin	55W27
	4.1	t	4.1	n scin	55W27
	4.1	t-∫el(θ)	2.1 *2*	n scin	55W27
	14	t-el	1.95 *2*	sphere	55G21
	14	k(t-el)*	0.98 *2*	sphere	55G21
Sm	1.0	t-el	0.07 *5*	sphere	55B08
	4.0	t-el	2.09 *10*	sphere	55B08
	4.1	el(θ)	graph	n scin	55W27
	4.1	t	4.3	n scin	55W27
	4.1	t-∫el(θ)	2.1 *2*	n scin	55W27
	14	t-el	1.96 *5*	sphere	55G21
	14	k(t-el)*	1.04 *2*	sphere	55G21
Sm^{150}	th	n,γ	66,000	ms	55M52
Sm^{152}	th	n,γ	12,000	ms	55M52
Ta^{181}	4.1	el(θ)	graph	n scin	55W27
	4.1	t	6.4	n scin	55W27
	4.1	t-∫el(θ)	2.7 *2*	n scin	55W27
Ta^{182}	pile	n,γ	13×10^3 *4*	5^dTa	55M19
	th	n,γ	47×10^3 *5*	5^dTa	55D05
W	4.0	t-el	2.6 *2*	sphere	55B08
	4.1	el(θ)	graph	n scin	55W27
	4.1	t	6.4	n scin	55W27
	4.1	t-el(θ)	2.4 *3*	n scin	55W27
Au^{197}	1.0	t-el	1.63 *10*	sphere	55B08
	4.0	t-el	2.75 *12*	sphere	55B08
	4.1	el(θ)	graph	n scin	55W27
	4.1	t	7.1	n scin	55W27
	4.1	t-∫el(θ)	2.7 *3*	n scin	55W27
	14	t-el	2.44 *2*	sphere	55G21
	14	k(t-el)*	1.76 *4*	sphere	55G21
Au^{198}	th	n,γ	26×10^3 *1*	3.16^dAu	55G29
Pb	1.0	t-el	0.23 *4*	sphere	55B08
	4.0	t-el	1.84 *8*	sphere	55B08
	4.1	el(θ)	graph	n scin	55W27
	4.1	t	7.8	n scin	55W27
	4.1	t-∫el(θ)	1.9 *3*	n scin	55W27
	10 to 15	el(θ)	graph	n scin	55R20
	13 to 18	t	graph		55B14
	14	t-el	2.49 *2*	sphere	55G21
	14	k(t-el)*	1.76 *4*	sphere	55G21
$Pb^{(207)}$	1.4-3.1	n,n′γ	graph	0.82^sPb	55S41
Bi^{209}	1.0	t-el	0.12 *4*	sphere	55B08
	4.0	t-el	1.98 *10*	sphere	55B08
	4.1	el(θ)	graph	n scin	55W27
	4.1	t	7.9	n scin	55W27
	4.1	t-∫el(θ)	2.2 *3*	n scin	55W27
	14	t-el	2.53 *2*	sphere	55G21
	14	k(t-el)*	1.86 *2*	sphere	55G21
E^{255}	pile	a	~40	Fm^{256}	55C30
Fm^{255}	pile	a	< 100	Fm^{256}	55C30

* k(t-el) = n, 2n + 2 n, 3 n - capture

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TABLE 3 — GROUND STATE Q'S

Q values are defined by the conservation equation, $M_1 + M_2 = M_3 + M_4 + Q$ or $Q = E_3 + E_4 - E_1 - E_2$ where the M's are the rest masses and the E's the kinetic energies of the reacting particles. Ground state Q's are those measured when the product particles are left in their lowest energy states. If the most energetic emitted particle has escaped detection, the true ground state Q is greater than the value given.

The energy standard used, when clearly stated by the experimenter, is mentioned with the reference. Usually the energy measurement for only one particle, either the incident or emitted light particle, presents difficulties. It is the standard used for this particle that is given.

N. B. A uniform policy for denoting the use of enriched or monoisotopic material is now in use in all four New Nuclear Data tables. This policy is described in the section on Conventions just following the introduction. Briefly, parentheses around the A value indicate natural material, no parentheses enriched or monoisotopic material.

Reaction	Value		Source	Detector	Ref.
$Li^{(6)}(d,He^3)He^{(5)}$	0.91	*9*	Cyc	s	55L24
$Li^6(p,d)Li^5$	- 3.0		Cyc	pc, scin	55L09
$Li^{(7)}(d,\alpha)He^{(5)}$	14.26	*9*	Cyc	s	55L24
$Be^8 \longrightarrow 2He^4$	0.090		CcW	pc	55T03
$Be^9(d,n)B^{10}$	4.54	*6*	CcW	ppl	55G24
$B^{10}(p,\alpha)Be^7$	1.07	*10*	Cyc	pc	55R16
$B^{11}(d,n)C^{12}$	13.81		CcW	ppl	55I06
$C^{(12)}(p,\alpha)B^{(9)}$	- 7.58	*10*	Cyc	pc	55R16
$C^{(12)}(t,\alpha)B^{(11)}$	3.85			ppl	55C17
$C^{13}(d,n)N^{14}$	5.41	*6*	CcW	ppl	55G24
$O^{18}(d,p)O^{19}$	1.735	*8*	VdG	s	55H28
$F^{19}(t,p)F^{21}$	6.03	*10*		ppl, scin	55B26
$F^{19}(\alpha,n)Na^{22}$	- 2.0		Cyc	pc	55D04
$Mg^{(24)}(d,\alpha)Na^{(22)}$	1.953	*12*	CcW	s	55B32
$P^{31}(\gamma,n)P^{30}$	-12.33	*5*	βtron	2.5ᵐP	55B82
$P^{31}(\alpha,n)Cl^{34}$	- 5.7		Cyc	pc	55D04
$S^{34}(p,n)Cl^{34}$	6.1		Cyc	ppl	55A03
$A^{36}(\alpha,p)K^{39}$	- 1.28	*3*	Cyc	ppl	55S27
$A^{(40)}(n,\alpha)S^{(37)}$	- 2.5	*1*	CcW	ic	55B78
$A^{40}(\alpha,p)K^{43}$	- 3.36	*3*	Cyc	ppl	55S27
$K^{(39)}(\alpha,p)Ca^{(42)}$	- 0.19	*7*	Cyc	pc	55S07
$K^{(41)}(\alpha,p)Ca^{(44)}$	0.98	*10*	Cyc	pc	55S07
$Ca^{(40)}(d,n)Sc^{(41)}$	- 0.60	*5*	Cyc	ppl	55P07
$Ca^{(43)}(d,p)Ca^{(44)}$	9.07	*7*	Cyc	pc	55S07

Reaction	Value		Source	Detector	Ref.
$Fe^{54}(\gamma,n)Fe^{53}$	-13.65	*5*	βtron	9ᵐFe	55B88
$Fe^{54}(d,p)Fe^{55}$	7.18	*7*	Cyc	pc	55M24
$Fe^{56}(d,p)Fe^{57}$	5.49	*6*	Cyc	pc	55M24
$Fe^{57}(d,p)Fe^{58}$	7.89	*7*	Cyc	pc	55M24
$Ag^{107}(\gamma,n)Ag^{106}$	- 9.57	*7*	βtron	24ᵐAg	55B88

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